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BEST CAMERA PHONES 2019

GOOGLE PULLS ANDROID LICENCE: 5 REASONS NOT TO PANIC

+ HEAD TO HEAD

Google Pixel 3a/3a XL VS Pixel 3/3 XL

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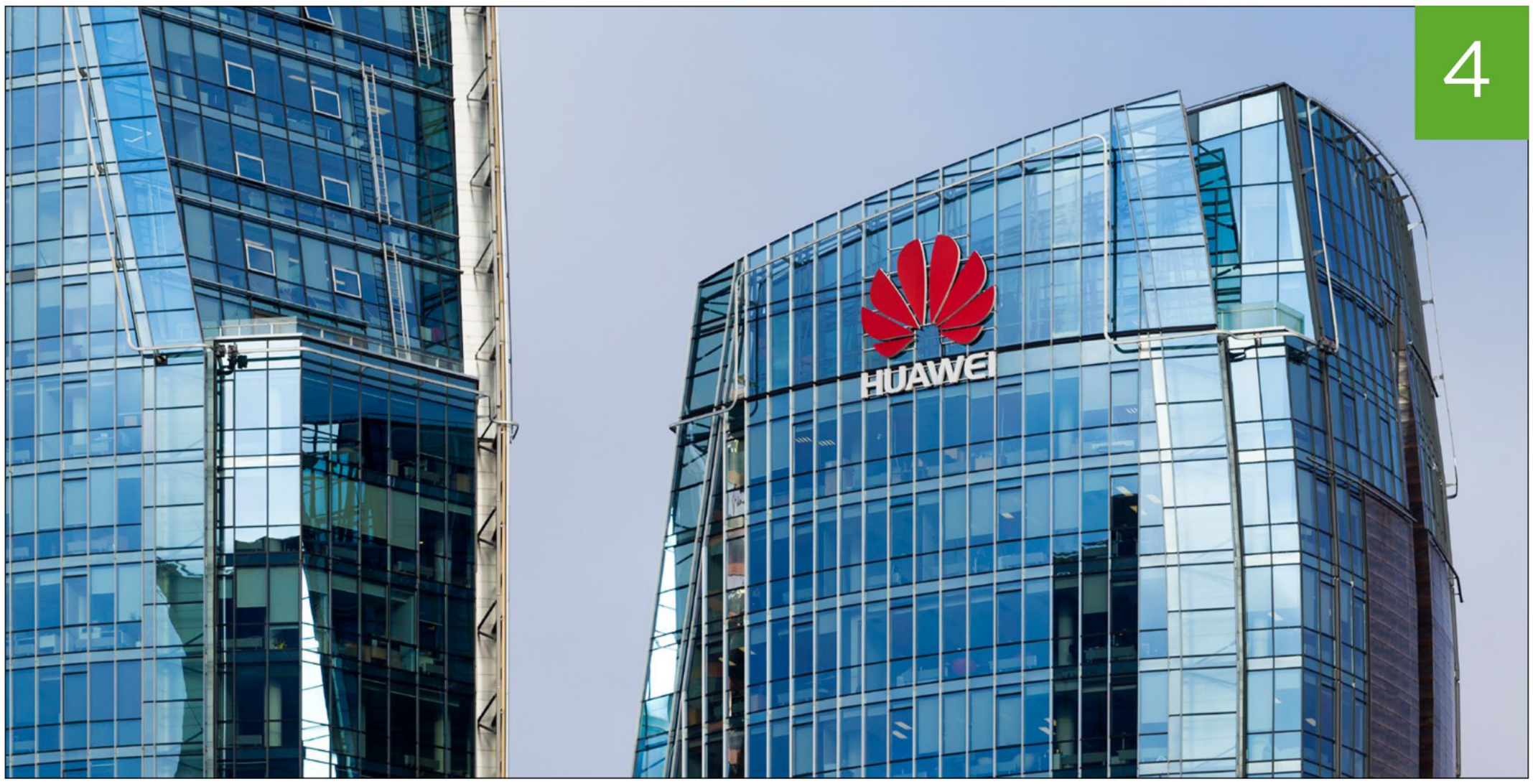

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Cover image: Ali Pazani on Unsplash

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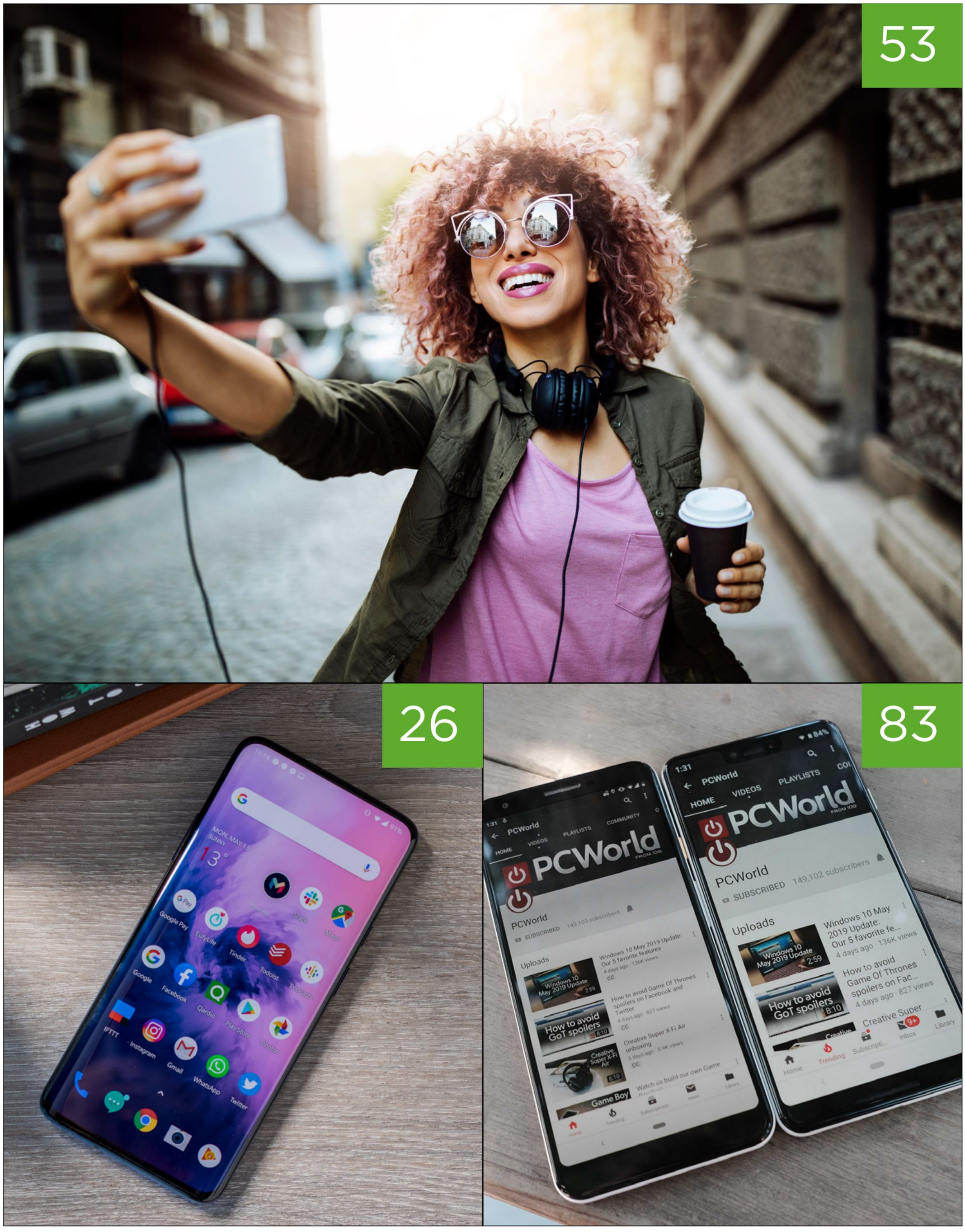
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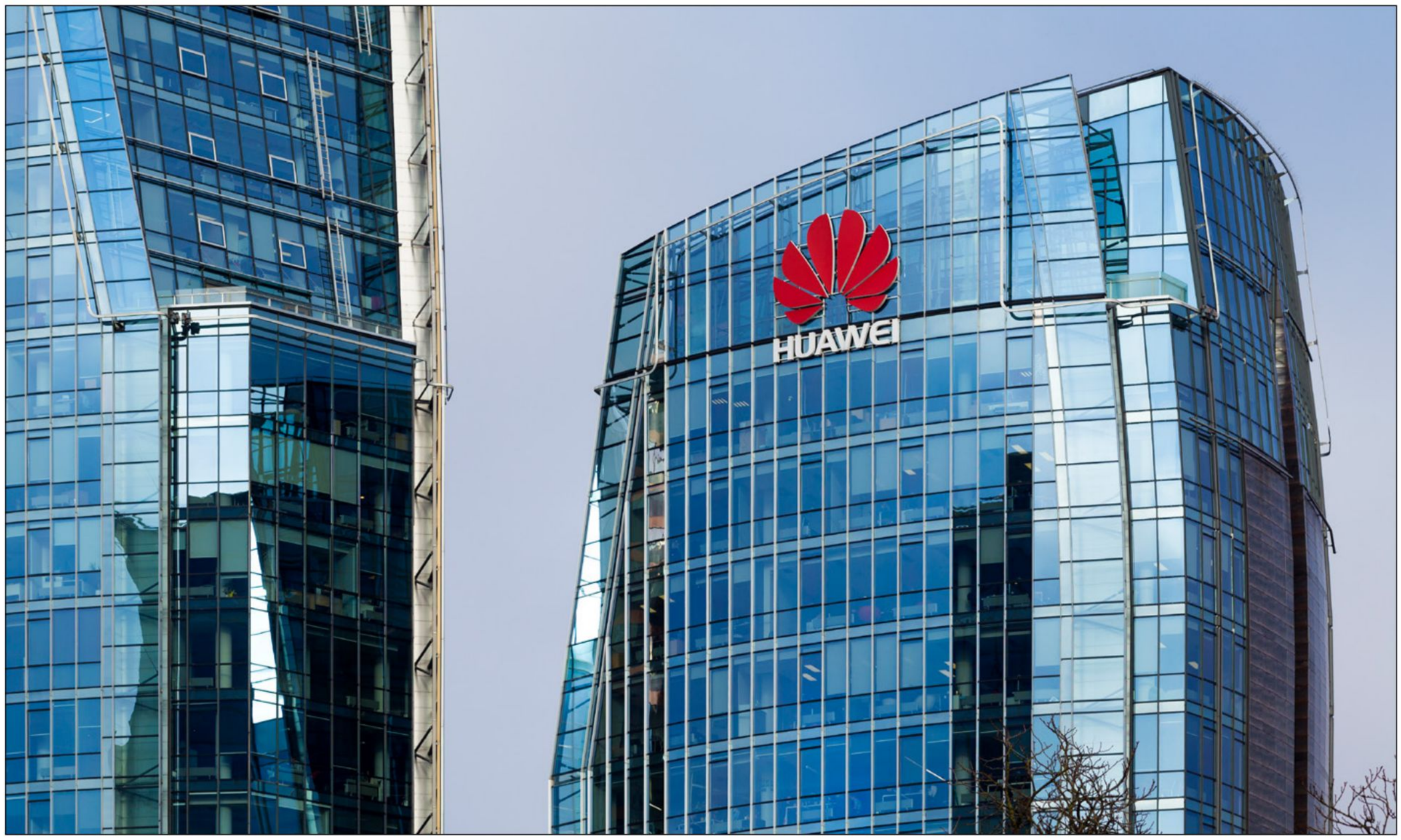


Google pulls Huawei's Android licence

Five reasons not to panic (yet) if you own a Huawei phone.
MICHAEL SIMON reports

The future just got a little dicey for millions of Huawei fans. Following a Trump administration Executive Order in May that put Huawei in the US government's crosshairs, Google has reportedly pulled its Android app, search, and Play Store licence from the smartphone giant, leaving future phones in doubt and current handsets in limbo while the details get sorted out.

So far, the two companies have been doing their best to play down the doom and gloom, while being purposefully vague about what happens next. In a statement, Google said, "For users of our services, Google Play and the security protections from Google Play Protect will continue to function on existing Huawei devices," while Huawei assured users that it "will continue to build a safe and sustainable software ecosystem, in order to provide the best experience for all users globally".

There's a lot of grey area within those words, but the bottom line is, nothing is changing right now. Your Huawei P30 Pro or Mate 20 will continue to function as normal, and you'll be able to download, delete, and update apps as you've always been. And there's good reason to believe that things won't change for a while,

1. Transitions take time

Since Google's decision to revoke Huawei's licence is a recent one, it will likely be a very long time before the effects are felt. Even if it's a universal ban, removing apps, search, and the Play Store from Huawei phones isn't as easy as flipping a switch, as Google's services are intertwined into Android and Huawei's EMUI skin. So your Huawei phone will work the same today as it did yesterday, and likely will for many months to come while the two companies work out how an Android world looks without Google.

2. Existing phones might be exempt

We don't know the full details of Google's licence revocation, but there's a chance that phones that

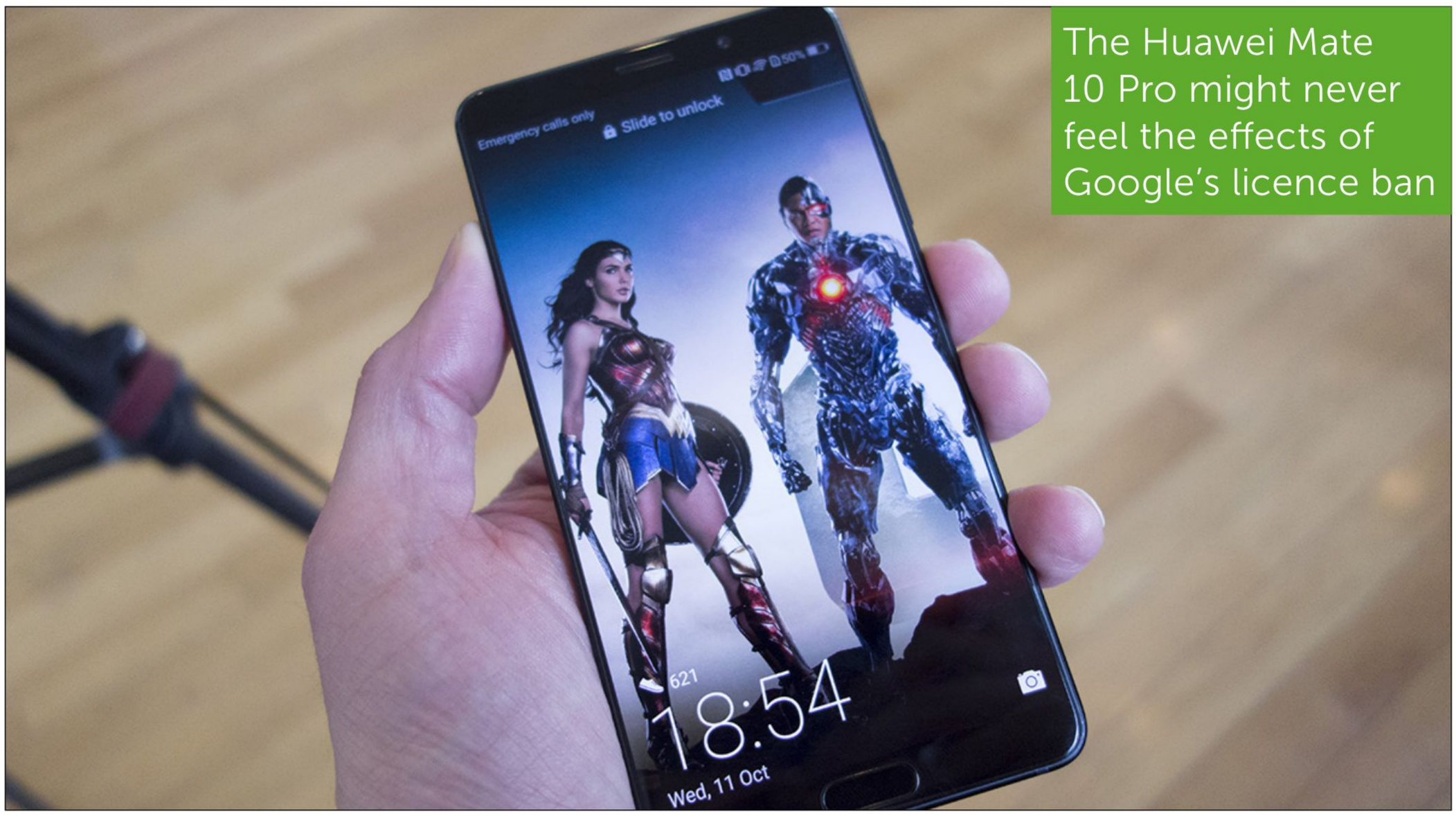
are already on the market will be exempt from the decision. Huawei had a contract in place with Google that covered all of its phones, and it sold them to customers based on the inclusion of the Play Store and Google's services, so lawyers and executives will need to come to an agreement. There's a lot to be worked out by Google, Huawei, and the US government, and until then, older Huawei phones will likely still receive security and app updates as they did before.

3. Huawei likely has a plan

While the news that Google has cut off Huawei's Android licence is definitely shocking, it's not all that surprising. The US government has had it in for Huawei for a while, and a soft ban on selling Huawei's handsets in the United States was already in place. Google's move represents the so-called nuclear option, but the Chinese firm had to anticipate that something like this could happen at some point.
So the company likely has several plans in place, including a ground-up redesign of its EMUI OS that doesn't include any Android source code and several contingency options that replace Google's services. Of course, that raises just as many questions – the least of which, how secure it would be – but I'm sure Huawei's engineers are hard at work on the solutions.

4. EMUI OS isn't affected

It's important to note that no matter how and when the licence revocation goes into affect, Huawei's core EMUI code won't be affected. That's because it's



The Huawei Mate 10 Pro might never feel the effects of Google's licence ban

based on the Android Open Source Project, which is fully free for anyone to use, no matter their status or relationship with the US government. So while Google can block the use of its apps and the Play Store on Huawei phones, most of what you know about EMUI could stay intact if Huawei chooses. Of course, it's unlikely EMUI will operate the same way without things like the Play Store, Chrome, and Google Maps, but it's possible.

5. Google doesn't want to hurt users

The fact of the matter is, Google has as much to lose in this fight as Huawei does. It's not just that it's relinquishing a major client, it's that millions of users already own Huawei phones running Android and Google apps on them. If apps are broken, updates stop coming, or Play Store security is compromised,

is reflects just as poorly on Google as it does on Huawei. So Google will likely work with Huawei and the US government to come up with a solution that's amenable to all parties and doesn't leave Huawei phones vulnerable to attack.

ARM memo suggests Huawei losing access to essential technology

Future Huawei phones might not have a chip to run them. MICHAEL SIMON reports

The hits keep coming for Huawei. Following the revocation of its licence to use Google apps and the Play Store on its Android phones, and a ban by several major chipmakers, including Intel,

Broadcom and Qualcomm, a leaked memo obtained by the BBC has revealed that ARM has ordered its employees to cease "all active contracts, support entitlements, and any pending engagements" with the beleaguered China-based tech giant.

While ARM is a UK-based company, its chip designs contain technology that originated in the US and subsequently are believed to be subject to the Commerce Department's blanket ban. The memo says ARM employees are no longer able to "provide support, delivery technology (whether software, code, or other updates), engage in technical discussions, or otherwise discuss technical matters".

While Google's revocation of Huawei's Android licence might seem like a bigger story, losing ARM could be just as devastating to the company. Huawei is one of the few phone makers that doesn't use Qualcomm's Snapdragon chips in its phones. Its homegrown Kirin processors have made the P30 and Mate 20 handsets among the fastest around. The Kirin chips also include didactic image signal processors that aid in things like low-light and portrait photography.

However, those chips are built using the ARM foundation, which could put future releases in jeopardy. What's more, it means Huawei may have lost access to the only two chipset architectures supported by Android: ARM and x86. So even if it were able to design a completely new chip devoid of ARM's intellectual property, there's no guarantee that it would work with the Android Open Source Project code. While this year's crop of processors

The ARM-based Kirin processors are part of what makes Huawei's cameras so great

are likely already designed, losing ARM would mean Huawei would have to design a completely new chip architecture and operating system within the next year, which seems like an impossible task.

The move would also affect Honor phones, which is an affordable product line made by Huawei. In April, Honor launched the 20 Pro powered by Huawei's top-of-the-line Kirin processor.

In a statement, Huawei expressed optimism over the issue and took a shot at the US-led campaign: "We value our close relationships with our partners, but recognize the pressure some of them are under, as a result of politically motivated decisions. We are confident this regrettable situation can be resolved, and our priority remains to continue to

deliver world-class technology and products to our customers around the world."

Based on the memo, ARM seems unsure whether it falls under the US ban, so it's possible Huawei could be granted a reprieve. Plus, the US government has signalled it may be willing to bend in the interest of consumer safety. Following the Android licence revocation, it granted a 90-day temporary general licence so Huawei could continue to ensure existing handsets receive security updates.

REVIEW

Honor 20 Pro

Price: €599 (UK £Tbc) ★★★★☆

Many of Honor's phones are priced low, and the 20 Lite, which sits at the bottom of the series, costs just £249. That was launched at the end of April, and Honor left around a month before releasing the 20 and 20 Pro, the latter of which we're reviewing here. These two phones are incredibly similar, save for the cameras but although we were given early access to the Pro model, Honor is keeping the UK price under wraps until the launch itself.

Note: Although Honor is a sub-brand of Huawei, the 20 and 20 Pro aren't affected by the restrictions imposed by the US on the firm's new phones because

they were already certified by Google. This means there's no issue with Android security updates or access to Google apps such as Gmail, Google Play and YouTube on these phones.

Price and availability

The Honor 20 Pro costs €599 and will go on sale in July 2019. There is no UK pricing yet, but it could work out around £579. This means it will have some very stiff competition, including from the brand-new OnePlus 7 Pro (see **page 26**). However, the regular Honor 20 is €499 and the official UK price is £399. This could mean that the Pro will actually cost £499, a significant sum less than the P30, which costs £699, and the OnePlus 7 Pro (which starts at £629).

There's another phone which is even more similar to the 20 Pro: Honor's own View 20. This launched back in January and can now be bought – well, the 128GB version – for under £400. The 20 Pro will only be sold as a 256GB model, and the equivalent View 20 costs £579, so assuming we're correct on the UK price of the Honor 20 Pro, there's every reason to buy the new phone if you must have 256GB.

Design

Put the 20 Pro next to the View 20 and apart from the smaller screen – 6.26in versus 6.4in – they both look the same with a small 'pin-hole' camera in the top-left corner of the screen.

Despite the fact that the 20 Pro isn't water-resistant, there's no headphone jack as you'll find on top of the View 20. Another difference is the

fingerprint sensor, which has been integrated into the side power button – like several Sony phones – and the camera arrangement is completely different.

It's now much more like the Huawei P30 and Pro, complete with camera bump. We'll get to the specifics of the cameras shortly.

The SIM tray is found on the left-hand side and takes two nano SIMs, though not a microSD card. Storage is not expandable. While there are two speakers, only the bottom-firing one is used for music, game and video audio. The top one is just for phone calls and – usefully – has a notification LED hidden behind its grille. That's something you won't find on the P30 Pro.

If you like to control your TV and other set-top boxes with your phone, then you'll appreciate the 20 Pro's IR blaster, though we couldn't find any pre-installed app that works with it.

Honor is making a big deal about the world's first Dynamic Holographic 'glassback'

REVIEW

Even at this price you shouldn't expect wireless charging, but there's 22.5-watt Super Charge which fills up the 4,000mAh battery in about an hour.

Design-wise, Honor is making a big deal about the world's first Dynamic Holographic 'glassback'. And it does look good, with a real depth thanks to the Triple 3D mesh technology used. But it doesn't catch the light as well as the 'V' design on the rear of the View 20. The 20 Pro is a fraction thicker than would be desirable and there's a hollow sound when you tap the back with your nail. Neither of these are a big deal, but they mean the 20 Pro doesn't feel the premium phone that it is.

Display

This is the one area where the Honor 20 Pro hasn't gone all out. It's a completely flat LCD screen, unlike the OLED displays with curved edges on some competitors, notably the OnePlus 7 Pro.

With a 1080p resolution, it's nothing really special: it's perfectly adequate for most people. But it's worth noting that it doesn't support HDR, and doesn't have an always-on clock option.

The thin bezels mean there's a 91.6 percent screen-to-body ratio, so the Honor 20 Pro isn't as large as you might expect. It's still a big phone, but it's not unwieldy.

Cameras

This is what the Honor 20 Pro is all about, and why Honor uses the tag line 'Capture Wonder' for the phone. There are four cameras on the back, a 48Mp

The Honor 20 Pro has four cameras on the rear

main camera with OIS, 16Mp wide-angle and an 8Mp 3x telephoto, again with OIS.

The fourth appears to have been put there just to bump up the numbers, as it's a 2Mp macro camera which isn't something many people will want to use very often and feels a bit gimmicky. It does take reasonable photos, though.

Returning to the main camera, it uses a Sony IMX586 sensor, which is found in a fair few phones now, including the View 20 and OnePlus 7 Pro (**page 26**), whose camera setup is extremely similar to the 20 Pro's. But Honor has paired it with an f/1.4 lens, which is one of the widest apertures we've seen on a phone.

It uses pixel-binning as do most of these very high resolution sensors, so defaults to a 12Mp mode. If you do want the full 48Mp resolution, not only can you have it, but you also get the AI Ultra Clarity mode found on the View 20.

So it's no surprise that image quality is basically the same, which is to say it's excellent. By default, the AI mode is switched off, and you may well prefer it that way. Turn it on and everything gets a saturation boost, plus sharpening so images are Instagram-ready.

We noticed some strange artefacts in some photos, possibly due to the AI or heavy-handed compression, but in most cases, photos are sharp, detailed and have great colours.

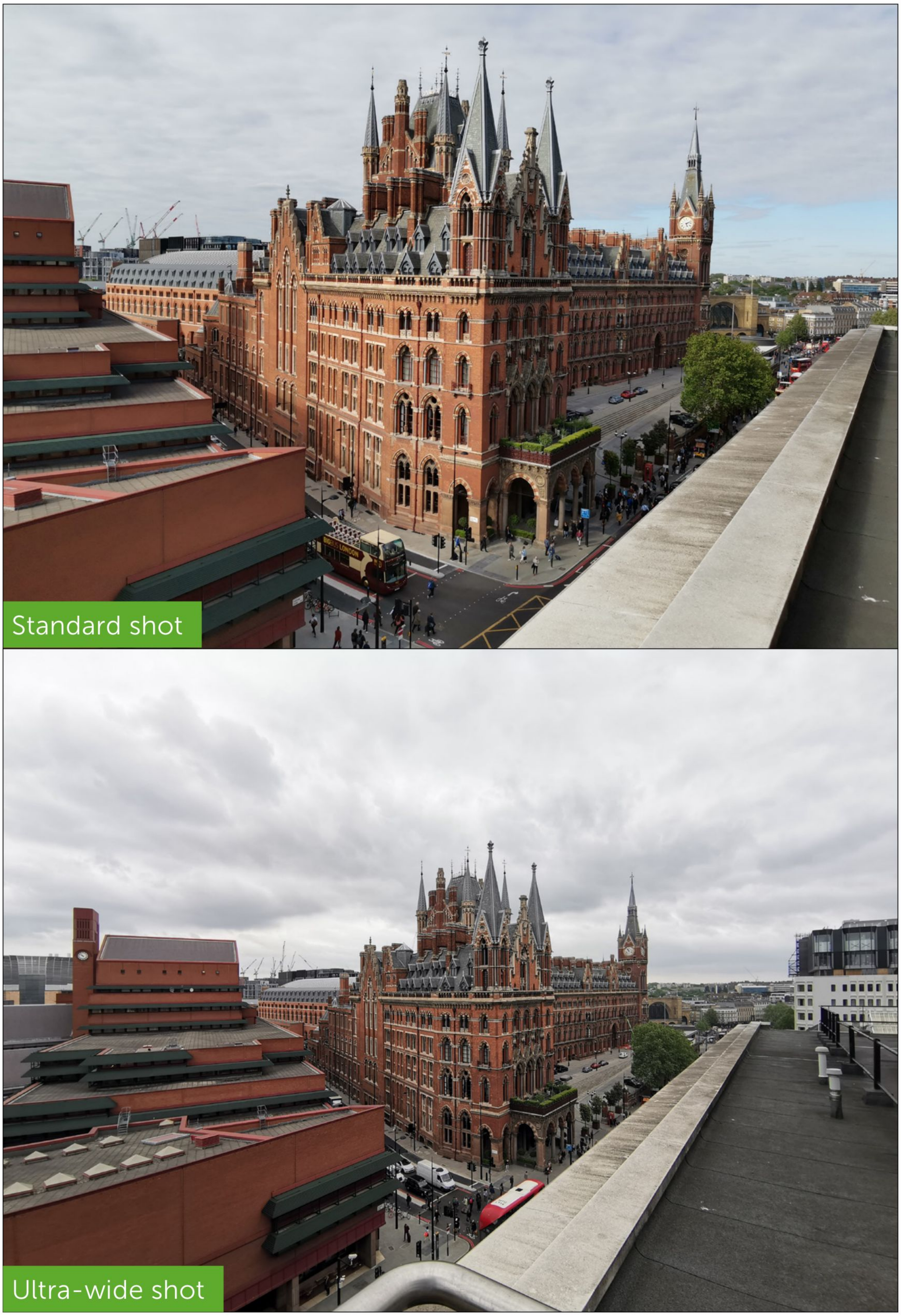
It's likely the 3x zoom is the same as in the Huawei P30 and Mate 20 Pro: we took some side-by-side shots and really couldn't tell the difference between them. Again, this is great news as it means you can get plenty of detail on those occasions where you can't get closer to your subject. You also get the 5x hybrid mode which uses detail from the 48Mp sensor to zoom in even further.

As you can see from our test shots, the Honor 20 Pro's cameras are impressive, as is the variety of shots you can take, from those ultra-wide landscapes through to the macro shots.

It's a shame HDR is – as with many Huawei phones – not automatic. It's a separate mode you'll find under 'More', along with Super Macro and the Pro mode.

For those concerned about video quality, the default mode is 1080p30 and there's good stabilization. You can use the three main lenses while shooting, and there's freedom to switch between them at will. 4K is limited to 30fps, and stabilization isn't nearly as effective.

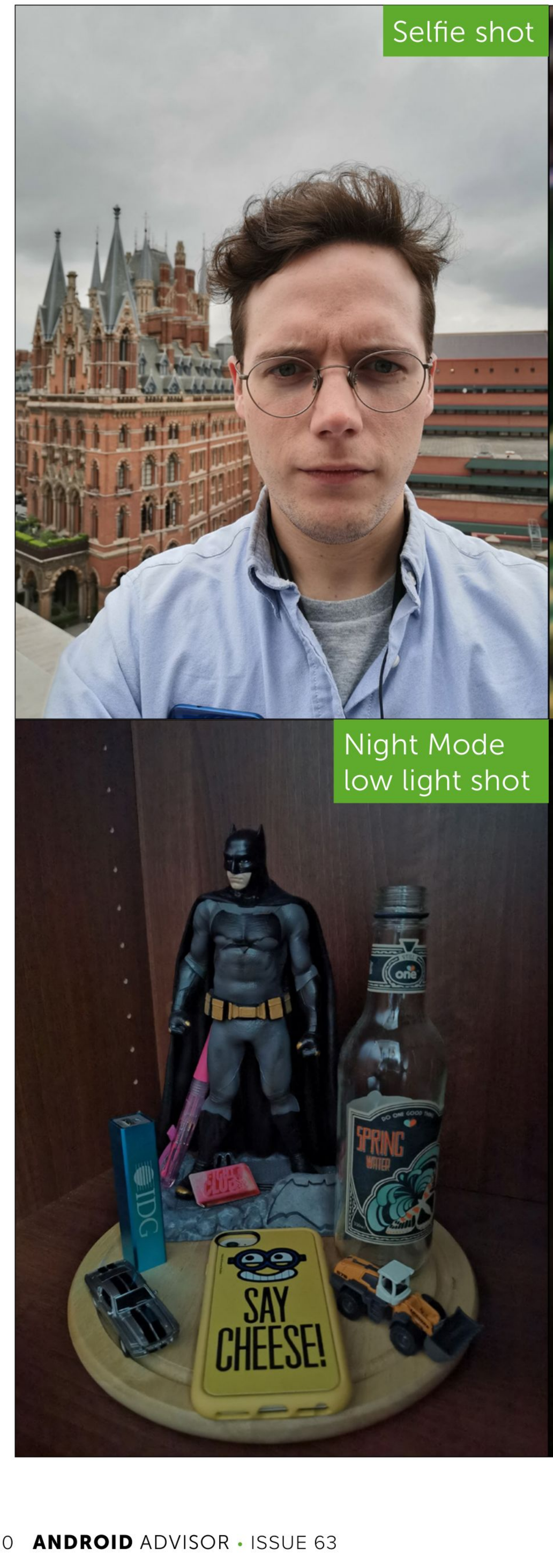
One of the other big features is the Super Night mode which works like the long-exposure Night mode

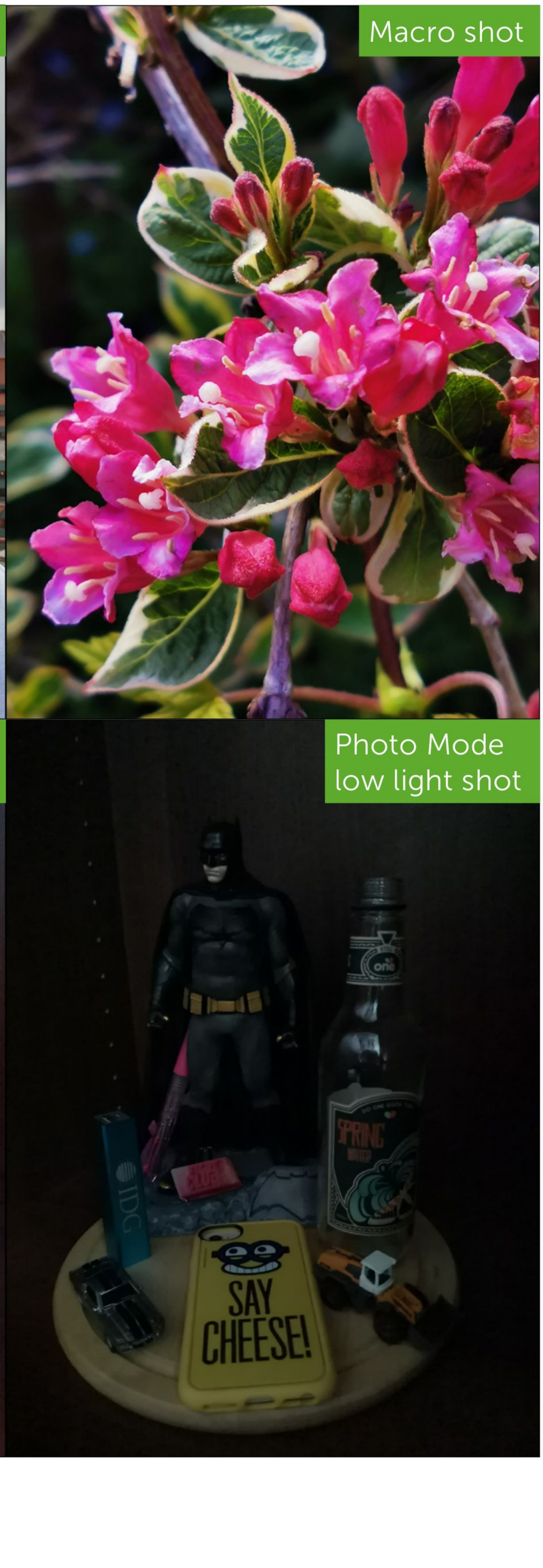


Standard shot

Ultra-wide shot

REVIEW


Selfie shot


Macro shot

Night Mode
low light shot

Photo Mode
low light shot

on the P30, keeping shots sharp even if you have shaky hands. It's good, but not amazing on the Honor 20 Pro, and certainly not as good as the OnePlus 7 Pro's new night mode. It's still worth using though, and gives noticeably better results than the standard photo mode. Usefully, Super Night mode can also be used with the ultra-wide lens.

As mentioned, the selfie camera is excellent. And it's great to have basically the same 32Mp camera you get on the much more expensive Huawei P30 Pro. In bright light detail is wonderful. It's best not to use the portrait mode, which doesn't do an amazing job of separating wisps of hair from the background, but it's there if you want it. Portrait mode works a lot better on the rear camera and we were able to take some great-looking photos with it.

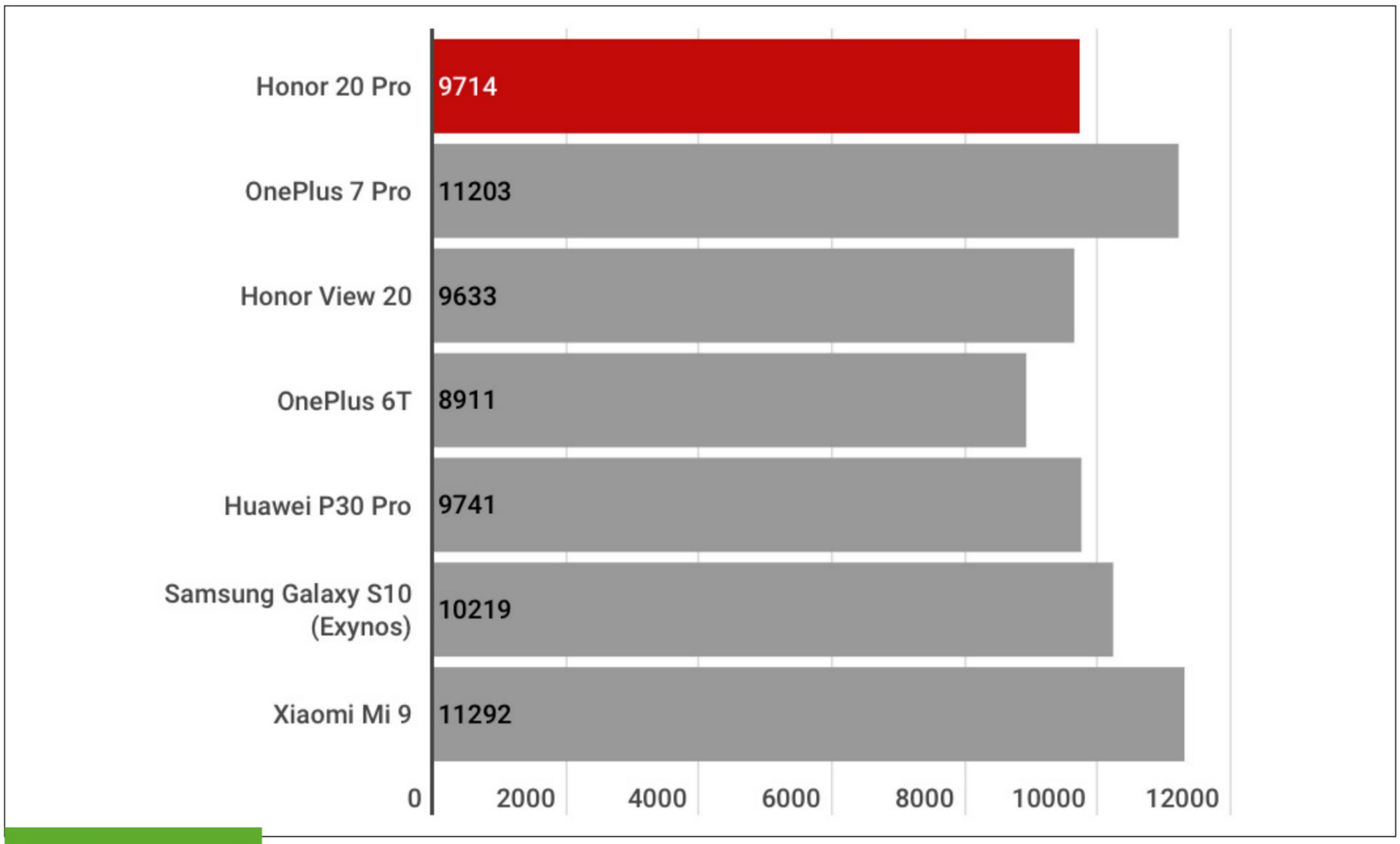
Performance

With the Kirin 980 on board and 8GB of RAM performance was never in question. It's a fast chip and more than up to the job, as well as competing with the Snapdragon 855. It's great to see this level of power in phones a lot cheaper than Huawei's flagships, and it's also great for gaming.

GPU Turbo 3.0 is supported and Fortnight is kind of pre-installed, so you can take advantage of the speed as soon you've updated it via the installer app.

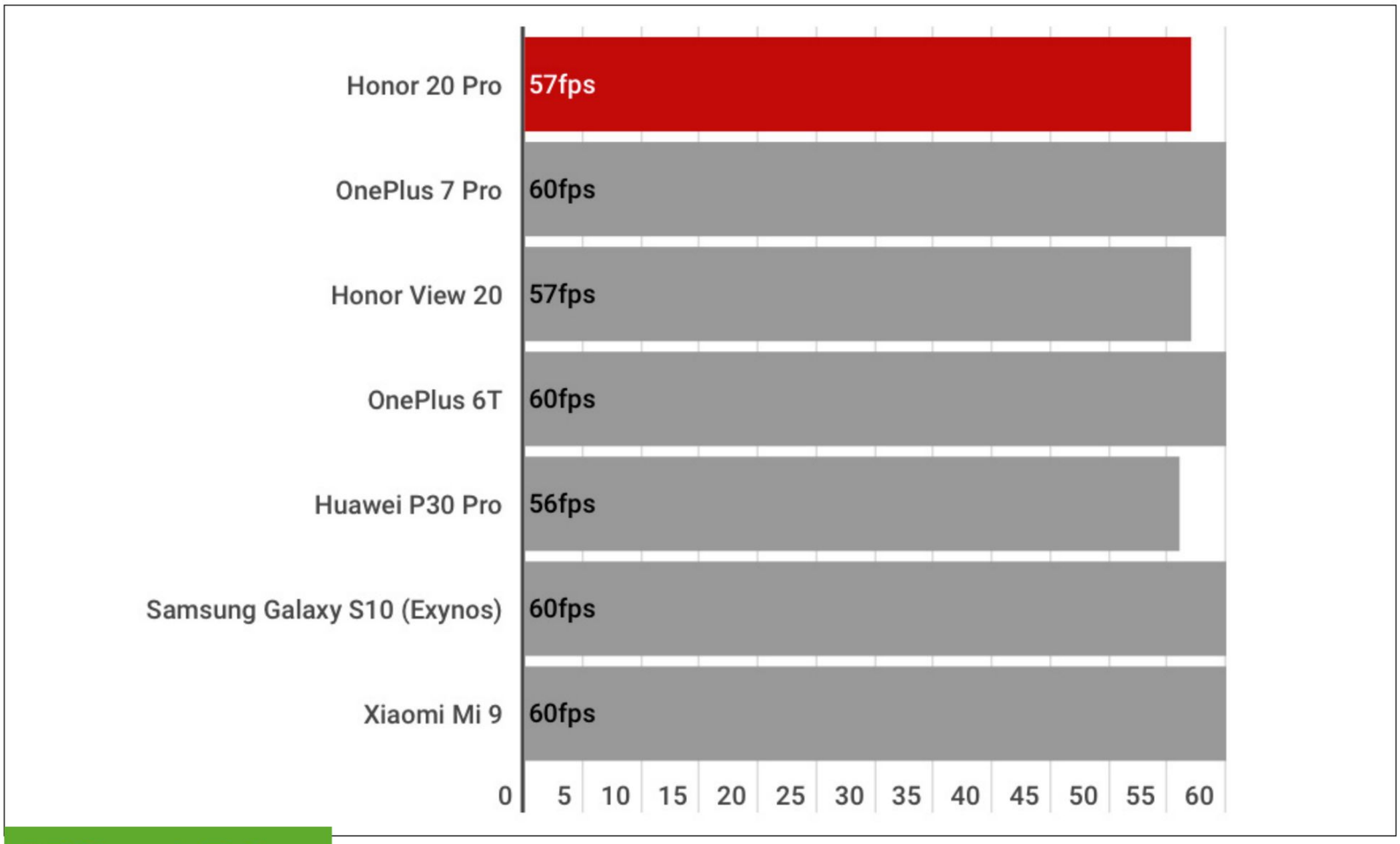
Battery life is also excellent, but as ever, how long you get between charges depends on how much you use the phone and how many apps you have running in the background. There are various power-saving modes, but you'll prefer not to use them in

REVIEW



Geekbench 4

GFXBench Manhattan



GFXBench T-Rex

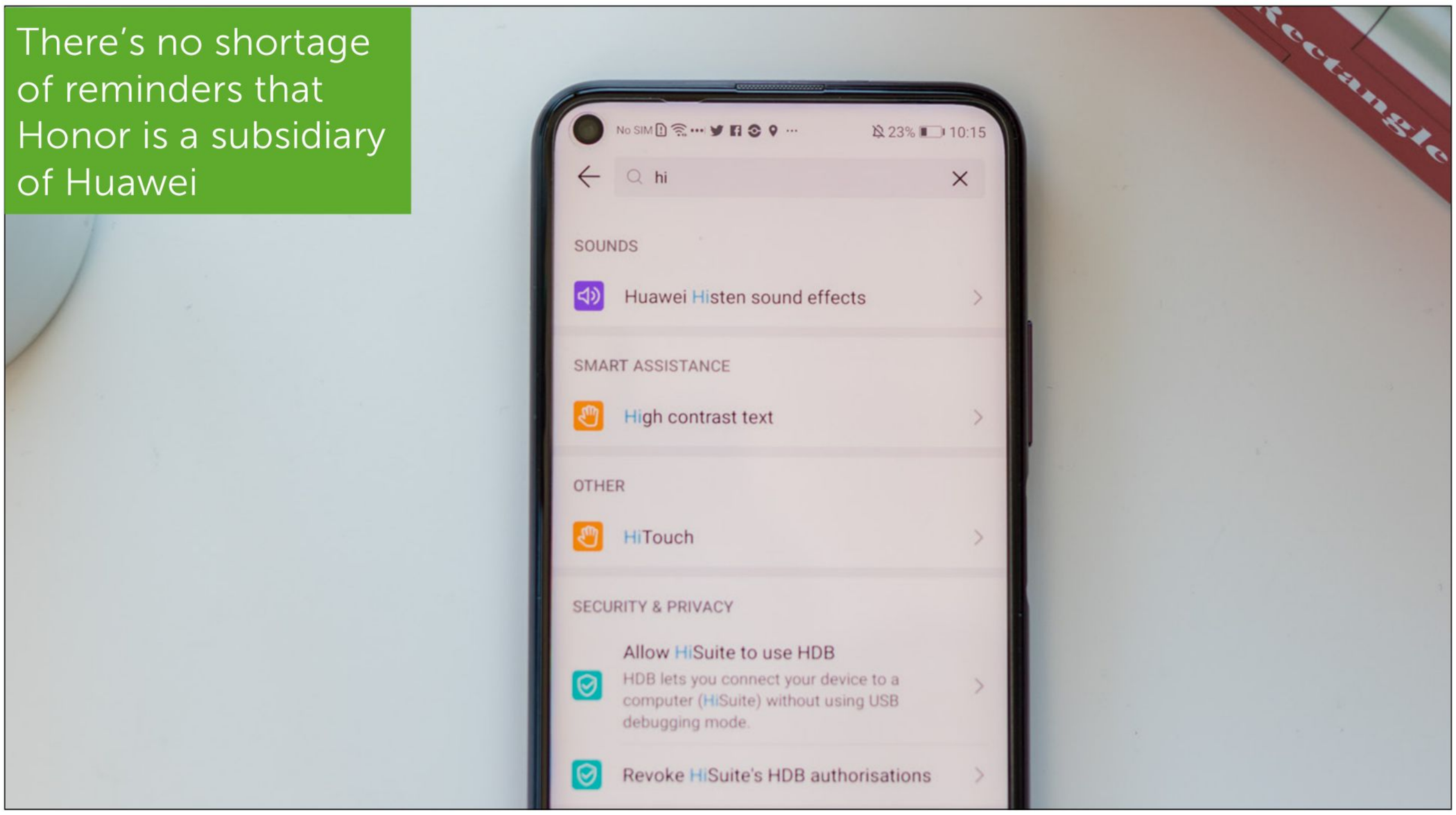
order to ensure you're not left waiting for emails and notifications to come through.

256GB of storage is generous at this price, but we can't help but wonder if a cheaper 128GB version would make the 20 Pro a more tempting proposition. The rest of the hardware includes Bluetooth 5, 802.11ac Wi-Fi, NFC and GPS.

Software

Honor calls it Magic UI these days – version 2.1 – but it's hard to tell the difference between it and Huawei's EMUI 9. There's no shortage of reminders that Honor is a subsidiary of Huawei, with many references in the settings – the audio effects are still called Huawei Histen.

REVIEW



So the advice is the same: it's a fine choice if you're used to iOS and / or still use an iPhone on a regular basis. But it does have its annoyances and is quite different from stock Android.

One gripe, which might be directed at Android rather then Magic UI, is that no matter whether in standard navigation mode or the new full-screen gestures, we were too often thrown out of apps and back to the home screen as our palm came into contact with the bottom-left corner of the screen. That's one of the problems with having virtually no bezels: you need a palm rejection feature to detect that it's not a finger tapping a button or swiping.

Verdict

Without knowing the exact price, it's hard to say how the Honor 20 Pro stacks up against its rivals, but if it's

£600, then the OnePlus 7 Pro is a better deal. Closer to £500 and it may well be the phone for you if you love taking selfies. But if not, and you don't mind losing the wide and telephoto cameras, then the View 20 should be a tempting alternative, especially if you can live with 128GB of internal storage. **Jim Martin**

Specifications

- 6.26in (2,340x1,080; 412ppi) IPS LCD capacitive touchscreen
- Android 9.0 (Pie); Magic 2.1
- HiSilicon Kirin 980 (7nm) processor
- Octa-core (2x 2.6GHz Cortex-A76, 2x 1.92GHz Cortex-A76, 4x 1.8GHz Cortex-A55) CPU
- Mali-G76 MP10 GPU
- 8GB RAM
- 256GB storage
- Four rear-facing cameras: 48Mp, f/1.4, 28mm (wide), 1/2in, 0.8µm, Laser/PDAF, OIS; 16Mp, f/2.2, 13mm (ultrawide), 1/3.1in; 8Mp, f/2.4, 80mm (telephoto), 1/4.4in, Laser/PDAF, OIS, 3x optical zoom; 2Mp, f/2.4, 27mm (wide), dedicated macro camera
- Front-facing camera: 32Mp, f/2.0, 0.8µm
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0
- A-GPS, GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint scanner (side mounted)
- USB 2.0 Type-C 1.0 reversible connector
- Non-removable 4,000mAh lithium-polymer battery
- 154.6x74x8.4mm
- 182g

REVIEW

OnePlus 7 Pro

Price: £699 from **fave.co/2liqzgf** ★★★★★

The near-meteoric rise of OnePlus has in large part been thanks to a pretty clear strategy: offer the most important features of the year's biggest flagships, minus the flashy fluff, at a fraction of the price. With the OnePlus 7 Pro, that all changes.

The 7 and 7 Pro phones mark the first time that OnePlus is releasing two phones at once: the 7 is the natural next step from last year's 6T, while the 7 Pro is a step up from that. It's a full-blooded flagship, OnePlus throwing the gauntlet down and trying to prove once and for all that it can make phones to rival the likes of the Galaxy S10 or Huawei P30 Pro

if it wants to. And on the strength of the 7 Pro, the company clearly can.

I've been using the 7 Pro for over a week, and I have been seriously impressed. The core OnePlus ethos is still present, but backed up by better specs focused on two of the areas of the phone people really use the most: the camera and the screen.

Display

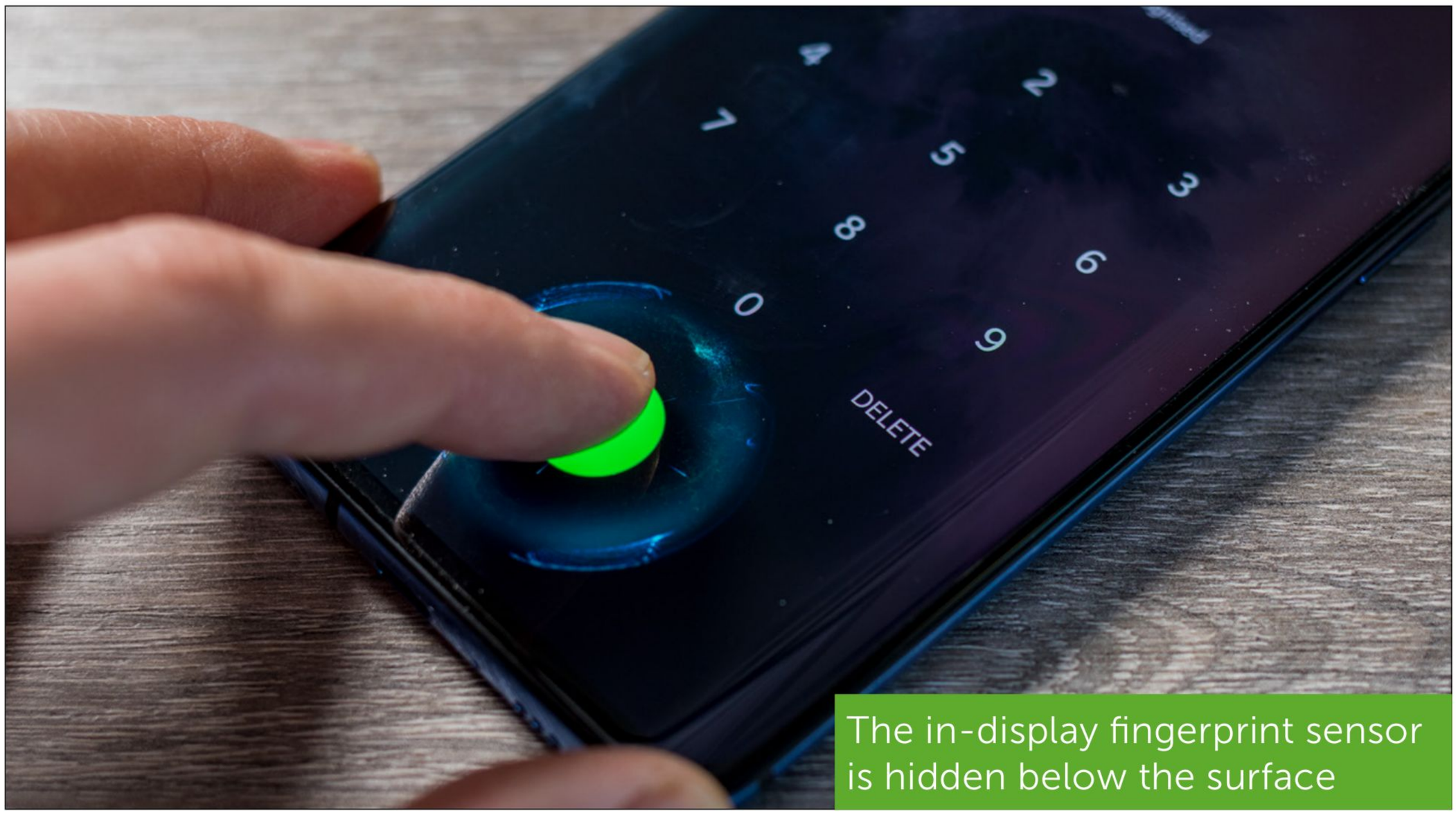
Easily the first thing you'll notice about the 7 Pro is the display, which excels in just about every way it is possible for a smartphone screen to excel.

Size? A whopping 6.67in. Refresh rate? A smooth 90Hz. Resolution? QHD+ – or 3,120x1,440 to be precise. I could go on: colour range, pixel density, curved edges, HDR, Gorilla Glass 5 – on paper this is one of the best panels you'll find in a smartphone today, and it's entirely uninterrupted by a notch.

The 90Hz refresh rate is perhaps the most welcome new feature. Mostly limited to gaming phones like the Razer Phone or Asus's ROG Phone before now, higher refresh rates smooth out animations across the board, leaving every interaction with the phone feeling faster and more fluid.

It's a change that's hard to put your finger on at first, but flick between the 60- and 90Hz options and you'll quickly realise that just about everything you do with the phone feels smoother – not to mention the benefits it brings when playing games or watching content that can make the most of the refresh rate.

There's a battery drain, of course, so if you prefer you can drop down to 60Hz – and smartly, even while



The in-display fingerprint sensor is hidden below the surface

on this mode the phone will still jump up to 90Hz when you're, say, playing a game that can make the most of it before dropping back down to 60Hz for your day-to-day stuff.

There's once again an in-display fingerprint sensor hidden below the surface, though it's improved from the 6T. OnePlus says it should be almost twice as fast thanks to an upgraded lens and larger sensor area, and it definitely feels it. It still fails to spot my thumb a few times too often, but it feels like this is almost as good as a dedicated physical scanner, which is the highest praise it could hope to get.

Throw in the giant resolution, curved edges (with palm rejection to avoid accidental presses) and support for HDR10+ across both YouTube and Netflix and it's clear that this screen is something special indeed.

Our review unit was the Nebula version

Those curved edges help the phone feel slim – though at 8.8mm it's not the absolute thinnest device around – while the Gorilla Glass 5 protection extends to the rear as well. This comes in one of three finishes: Mirror Gray, Nebula Blue (pictured above), and Almond. The blue in particular is stunning, with a slightly matte effect to the gradient design, while Almond is a creamier take on Apple's Gold iPhones.

Of course, I can't talk about the display or the design without addressing the notch – or rather, the lack thereof. The 7 Pro is one of the latest proper full-screen phones to hit the west, in this case by shifting the selfie camera into a small slider that pops up when needed, and retracts just as quickly.

Fall detection means it withdraws if you accidentally drop the phone, and naturally OnePlus assures us it's tested the mechanism hundreds of

thousands of times for durability's sake. It works for face unlock too, and is astonishingly quick there – the camera retracts almost as soon as it's opened, so it is still a split-second process.

Cameras

The selfie shooter isn't the only exciting camera here, though. Beyond the novel design, that one isn't all that exciting otherwise: it's a similar 16Mp camera to the one found in the 6T, just in a new spot.

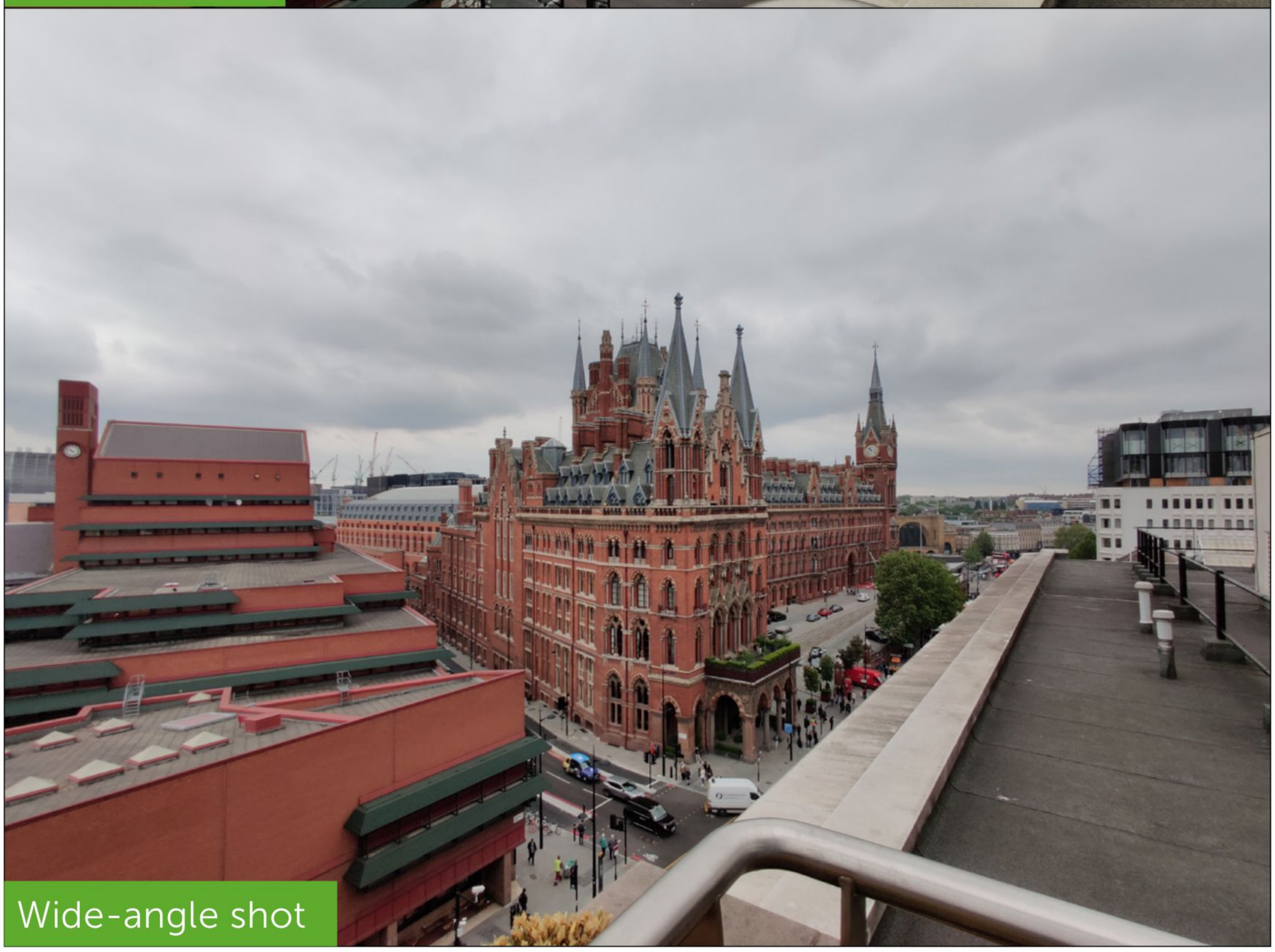
More interesting are the cameras you'll find when you flip the phone over (after briefly pausing to admire that blue gradient for the umpteenth time, of course). For the first time OnePlus is offering a triple camera setup, and one that could rival the best around.

Let's take it one lens at a time. The main camera is 48Mp, f/1.6 with optical image stabilization (OIS). It's powered by the same Sony IMX586 sensor you'll find in a few other similar smartphones, but the actual lens is an entirely custom design.

Sitting above the main camera is a 16Mp ultra-wide lens, with an f/2.2 aperture and a 117-degree field of view. There's a very slight fishbowl effect (which actually looks worse than it is thanks to the curved screen) but otherwise this does a good job.

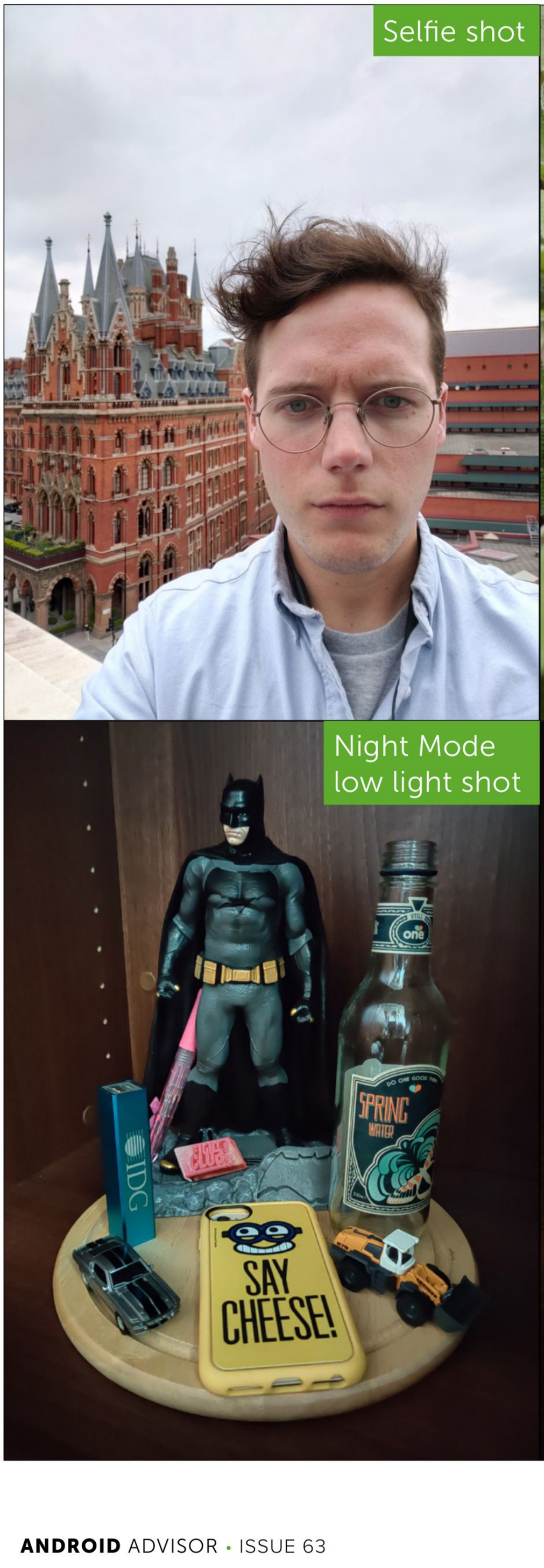
Finally, and more excitingly, the bottom camera is an 8Mp telephoto, with OIS and up to 3x optical zoom – while you can go up to 10x hybrid optical and digital zoom. This isn't quite into the 5x optical zoom territory of the Huawei P30 Pro (in fact this whole rear camera setup is almost identical to the regular P30), but it is capable of some sharp zoomed in shots.

Standard shot



Wide-angle shot

REVIEW


Selfie shot

Macro shot

Night Mode
low light shot

Low light shot

The software underlying all that hardware has had an update too, and the newly dubbed UltraShot algorithm is clearly an attempt to catch up with the competition – it's fair to say OnePlus has never been renowned for its photography flex.

Photos process more quickly, despite additional computational work as the camera makes more use of multiple shots to extract more information and enrich images – especially in a revamped take on Nightscape, OnePlus's take on a flash-free low light mode. This is now in the same conversation as the P30 Pro and Pixel 3 for low light photos, with astonishing sharpness and colour drawn out of even the darkest environments.

In general, photos are crisp and I've been impressed by the dynamic range the camera is capable of, while colours tend to be fairly accurate. That can mean photos look slightly muted if you're used to the heavily saturated shots taken by Huawei and Samsung's latest, but will deliver if you prefer something that looks more true to life. The optical zoom is comparable to the results in the P30, and actually yields a little more detail than some shots from that phone – though at the cost of slightly more noise.

As for video, the rear cameras can shoot up to 4K at 60fps, while the selfie lens will do 1080p at 30fps, and you also get the option of super slow motion from the rear cameras – either 1080p at 240fps, or 720p at 480fps.

Performance

It's probably clear by now that OnePlus is really leading on the display and camera when it comes

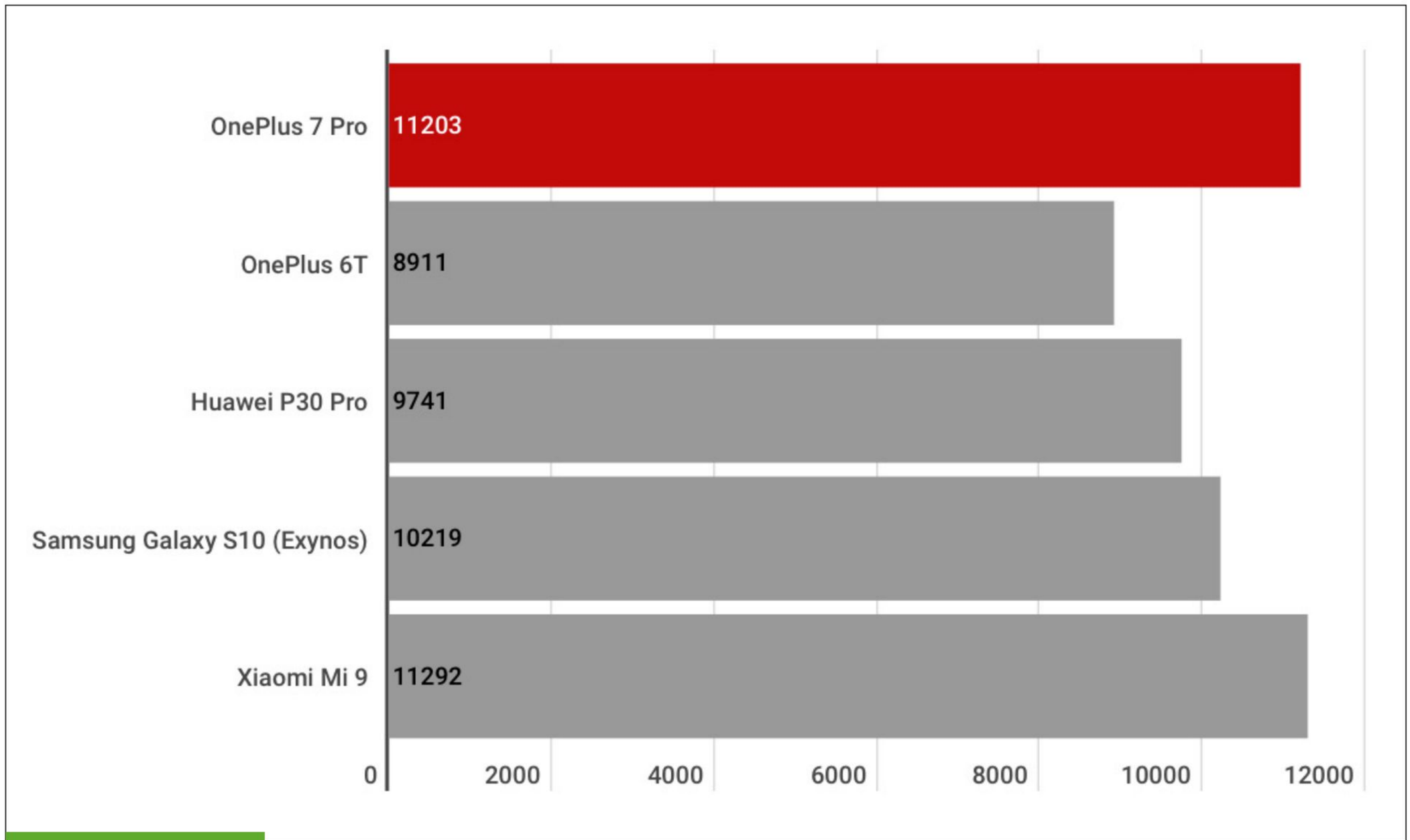
to the 7 Pro – two areas where the company has never previously made a name for itself, no doubt not by chance.

Still, it hasn't exactly skimped elsewhere. The processor is the flagship Snapdragon 855, and it's backed up by some meaty memory options, with up to 256GB storage and 12GB of RAM available – though there's no support for microSD cards, so what you get is what you get.

That storage is special, too: the 7 Pro uses UFS 3.0 – universal flash storage – which is a fancy way of saying that it should be able to save and access files much quicker. That means faster app opening, game loading, and file transferring – it's the equivalent to plugging an SSD into your computer. It's also the only phone on sale right now to boast the tech, though technically not the first – the Galaxy Fold uses UFS 3.0 too, but we all know how well that launch went. It's not clear yet how much of a difference the new drive is making in and of itself, but it's contributing to silky smooth performance across the board.

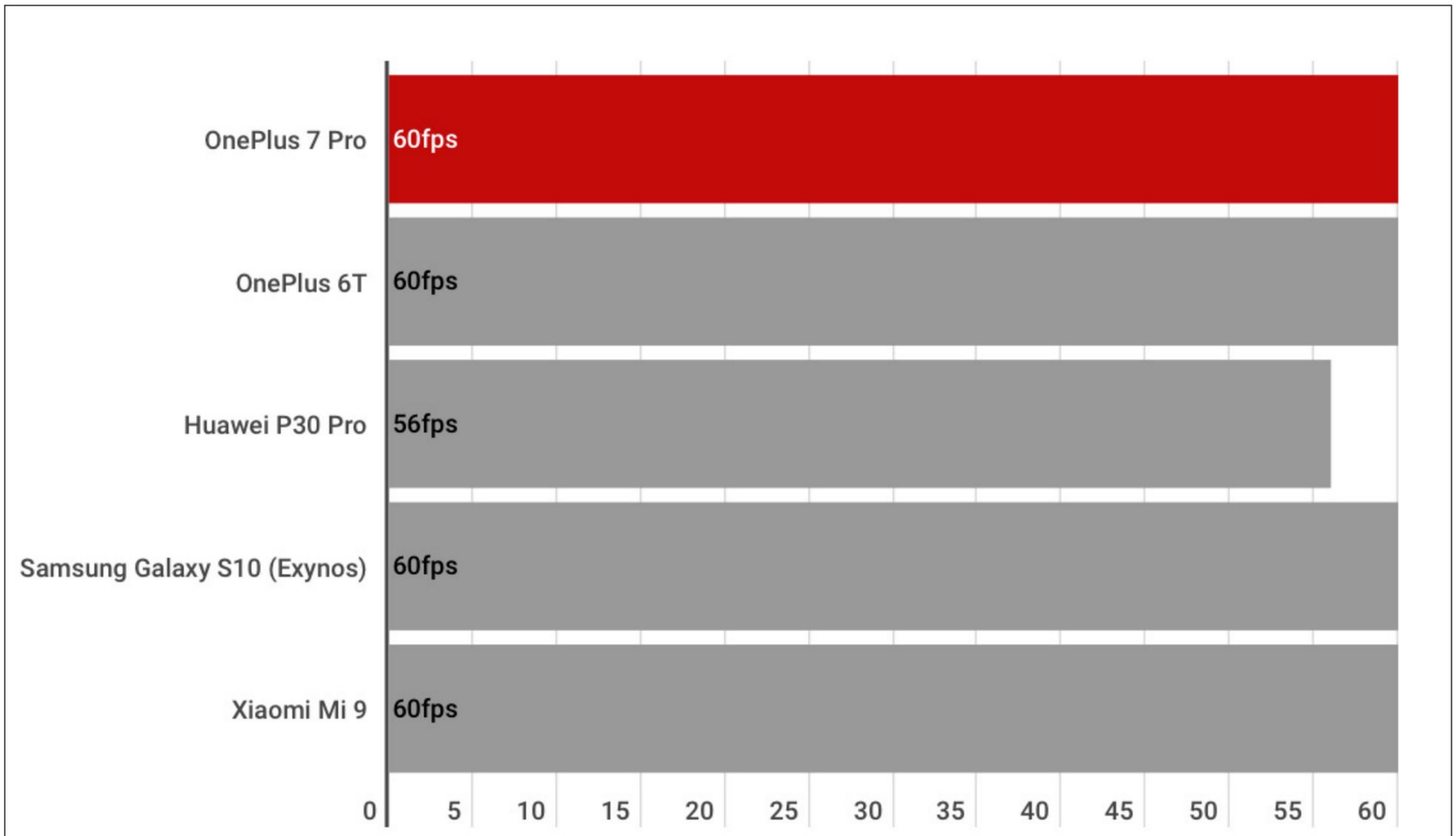
I've been testing the 12GB RAM, 256GB storage model, and unsurprisingly all that power has seen it sail through most of our benchmarks, with results up there with flagship rivals – though not blowing them away, and surprisingly it drops below the 6T on some of the graphical tests, where the extra RAM doesn't really contribute. This is on pre-release software though, which can complicate things, and I'd expect software updates to refine the hardware performance.

Either way, this thing is fast, and it's at the point where it's so fast that minor variations in individual



Geekbench 4

GFXBench Manhattan



GFXBench T-Rex

benchmarks really don't reflect anything to worry about unless you're absolutely obsessed about maxing out your frame rate in Fortnite.

The 4,000mAh battery just about stretched out to 48 hours of usage, so if you charge every day you shouldn't ever have to worry about running out – again, this is pretty much in line with similarly priced rivals. The inclusion of 30-watt Warp Charging also means it'll top up fast – it managed to get 64 percent of its battery back in just half an hour when charging from empty.

That charging is USB-C (still no support for wireless here, OnePlus says it just isn't good enough yet), with a USB 3.1 port. There's NFC, Bluetooth 5.0 (with aptX HD support), and stereo speakers with Dolby Atmos

– they sound good for a phone, but y'know. There's even a new haptic motor – something previous OnePlus phones have struggled with. These still aren't the best vibrations out there, but how many people really worry about that?

Finally, waterproofing. OnePlus says getting an official IP rating is a waste of money that drives prices up, so there's no official measure of how water-resistant the phone is. The company itself says the phone can survive a splash (there's even an extra layer of liquid protection around the sliding selfie cam), but doesn't recommend you take it swimming.

Ultimately, an IP rating offers peace of mind that the 7 Pro just won't offer in that regard, but as OnePlus is quick to point out, no smartphone manufacturer covers liquid damage in its warranty – even those with industry-leading IP68 ratings. So basically this *should* keep working if you drop it in the bath, but I'm not about to risk the phone and this review to find out.

Software

Let's wrap it all up on a high note. As ever, OnePlus excels on the software side – Oxygen OS is probably our favourite Android skin, and the only one that's arguably better than Google's own efforts on the Pixel phones.

The look is close to stock, but with usability tweaks across the board and subtle UI tweaks to smooth over some of Android's rough edges. Not everything is perfect – swiping up for back remains one of the less intuitive gesture controls out there, and the lack of a true always-on display is still a

REVIEW

frustration, but for the most part this is about as good as Android gets. Tweaks this year are mostly minor, but welcome. There's a built-in screen recorder in case you want to share footage direct from your phone, which lets you record for as long as you want, pausing and resuming at any point, and record either internal or external sound.

The full-screen means no room for a notification LED, so instead OnePlus has turned to a software solution: the sides of the display will pulse with light when a notification comes through, with the colour actually determined by the app in question. It's a nice touch, but still actually easy to miss, as the light only pulses once – it won't keep flashing after the fact, as a normal LED might. That could get annoying of course, not to mention drain the battery, which is likely why OnePlus opted to avoid it.

Gaming mode has had an upgrade to give more granular notification controls, and there's even an enhanced version – branded by the e-sports team Fnatic – that not only blocks any and all notifications but also reroutes almost all of the phone's processing power and network signal towards your game.

If that all sounds a bit intense, Zen Mode is its chilled out counterpart. This also shuts down every notification, but goes even further: it basically locks you out of the phone entirely, leaving you able only to receive calls, phone emergency services, or use the camera. This lasts for 20 minutes – no more, no less – and once activated it's impossible to turn off. Yup, even if you turn the phone off and on again – this is the nuclear solution to terminal procrastination.

Verdict

I went looking for reasons not to give the OnePlus 7 Pro full marks, but I've struggled to find much to fault. The display, camera, and core specs are essentially all best-in-class – or close enough to count – while the few shortcuts (wireless charging, an IP rating) are easily explained away by a price point that still undercuts the closest comparable rivals by some way.

Yes, this costs a bit more than you're probably used to from OnePlus, but it delivers on enough of its promises to justify that price hike – and if you're not convinced, the regular OnePlus 7 is always there (outside the US at least), at the same old price OnePlus has been hitting for the last year or two.

In a year that's already seen both Samsung and Huawei drop pretty phenomenal flagships, OnePlus

REVIEW

has still managed to drop a device that might just be the phone to beat in 2019. **Dominic Preston**

Specifications

- 6.67in (3,120x1,440; 516ppi) Fluid AMOLED capacitive touchscreen
- Android 9.0 (Pie); OxygenOS 9
- Qualcomm SDM855 Snapdragon 855 (7nm) processor
- Octa-core (1x 2.84GHz Kryo 485, 3x 2.42GHz Kryo 485, 4x 1.8GHz Kryo 485) CPU
- Adreno 640 GPU
- 6GB, 8GB, 12GB RAM
- 128GB, 256GB storage
- Three rear-facing cameras: 48Mp, f/1.6, (wide), 1/2in, 0.8µm, Laser/PDAF, OIS; 16Mp, f/2.2, 13mm (ultrawide); 8Mp, f/2.4, 78mm (telephoto), 3x zoom, Laser/PDAF, OIS
- Front-facing camera: Motorized pop-up 16Mp, f/2.0, 25mm (wide), 1/3.0in, 1.0µm
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0, A2DP, LE, aptX HD
- A-GPS, GLONASS, BDS, GALILEO, SBAS
- NFC
- Fingerprint scanner (under display)
- USB 3.1 Type-C 1.0 reversible connector
- Non-removable 4,000mAh lithium-polymer battery
- 162.6x75.9x8.8mm
- 206g

Asus ZenFone 6

Price: £499 from **fave.co/2I7Vv2i** ★★★★½

After months of leaks and teasers Asus has finally revealed the ZenFone 6, and it certainly offers something different to most flagships on the market. It has a gorgeous all-display design with a camera array that flips between the back and front to cover all your photography needs. But, is it a gimmick or has Asus cracked the formula for the perfect bezel-less design? Read on to find out.

Cameras

There have been many different attempts from manufacturers to achieve a bezel-less display while

still providing access to the all-important front-facing camera, from notches to pop-up cameras, sliders and, with the introduction of the Asus ZenFone 6, Flip Cameras too.

The reversible nature of the camera module is interesting; rather than featuring a front-facing camera that would encroach on the display, the phone's rear-facing cameras can be flipped to face forwards.

The module has a 48Mp Sony IMX586 sensor, with 1.6µm pixels and an aperture of f/1.79, alongside a 13Mp 125-degree wide-angle camera, laser autofocus and a dual-LED flash. The flippy nature of the camera module provides users with incredible-quality front-facing lenses, and allows users to access advanced shooting modes previously exclusive to rear-facing cameras. Photo quality is generally great, with impressive detail and clarity, and the

The phone's rear-facing cameras can be flipped to face forwards

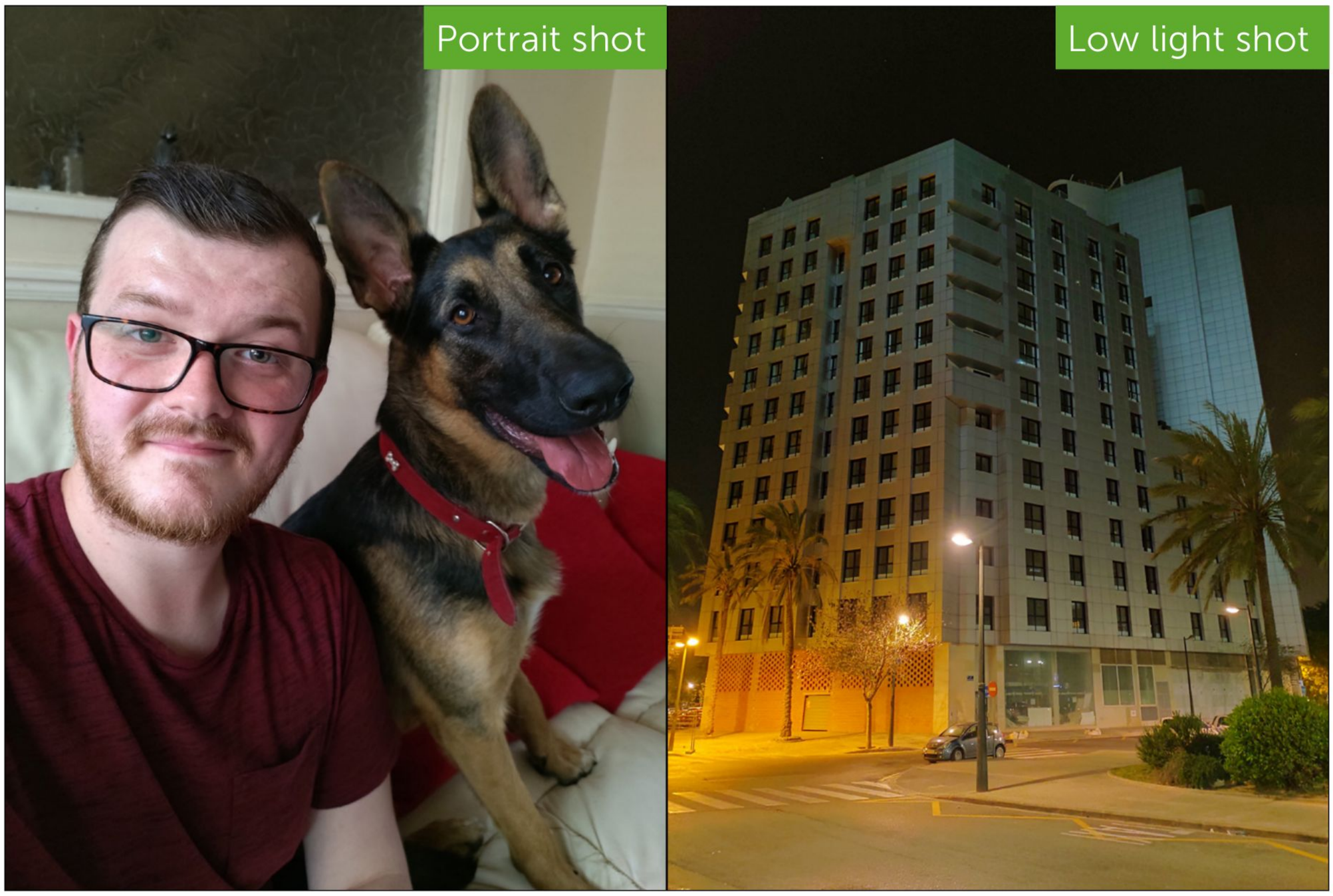
HDR+ mode produces gorgeous, detailed images in challenging lighting conditions.

Take a look at the below image of St. Pancras Renaissance Hotel; even when zooming in, you can make out fine details such as the brickwork of the building and street signs. The level of detail somewhat negates the need for a telephoto lens, as cropped images taken by the 48Mp sensor generally look great.

The 48Mp sensor performs well in low-light environments too, although the phone's dedicated Night Mode simply can't compete with that provided by the likes of Huawei, Samsung and Google. There's a decent level of light, but there's a slight sacrifice to overall clarity.

Standard shot

REVIEW



The 13Mp 125-degree wide-angle camera is great for group selfies, especially when combined with the flippy nature of the phone. It performs well in well-lit environments, but sadly, photos taken in low-light environments are noticeably dimmer than those taken by the 48Mp sensor.

Of course, there is a range of shooting modes that allow you to get creative with your photography. One of the highlights is the Portrait mode, complete with post-shot refocusing. It's also impressively accurate when it comes to edge recognition, even in point-and-shoot situations.

Oh, and the ability to take a panorama without actually moving the smartphone is a novelty that we will personally never get over.

One of the cool features of the Flip Camera is manual control; you can adjust the angle of the camera using the volume button, allowing you to find the perfect angle for your shots. It makes taking photos of animals and children easier too, as you can position the camera at a 90-degree angle and take photos from a horizontal position.

If you're worried about durability, don't; the housing features a G-Sensor that'll flip the camera back to its original position if it detects a fall, and the gear system should be good for over 100,000 flips – that equates to 28 selfies every day for five years. And a short video shown at the announcement showcased a child actively trying to force the camera open using a screwdriver, pins and more, and the module still functioned properly.

We haven't even mentioned the impressive suite of video tools at your disposal on the ZenFone 6. The highlight is the ability to record 4K at 60fps with electronic image stabilization. Videos are smooth, high quality and produce cinematic sweeps instead of wobbly pans, although the EIS does come at a cost; a rather cropped shot. You've also got access to a slow-mo mode that offers 480fps at 720p, or 240fps at 1080p. The promise of 480fps slow-mo is a little hollow though, as we noticed frame drops and jumps during slow-mo testing. We're glad to report that the same wasn't found when shooting at 240fps, suggesting that the camera and on-board tech isn't up to the task of processing 480 images per second.

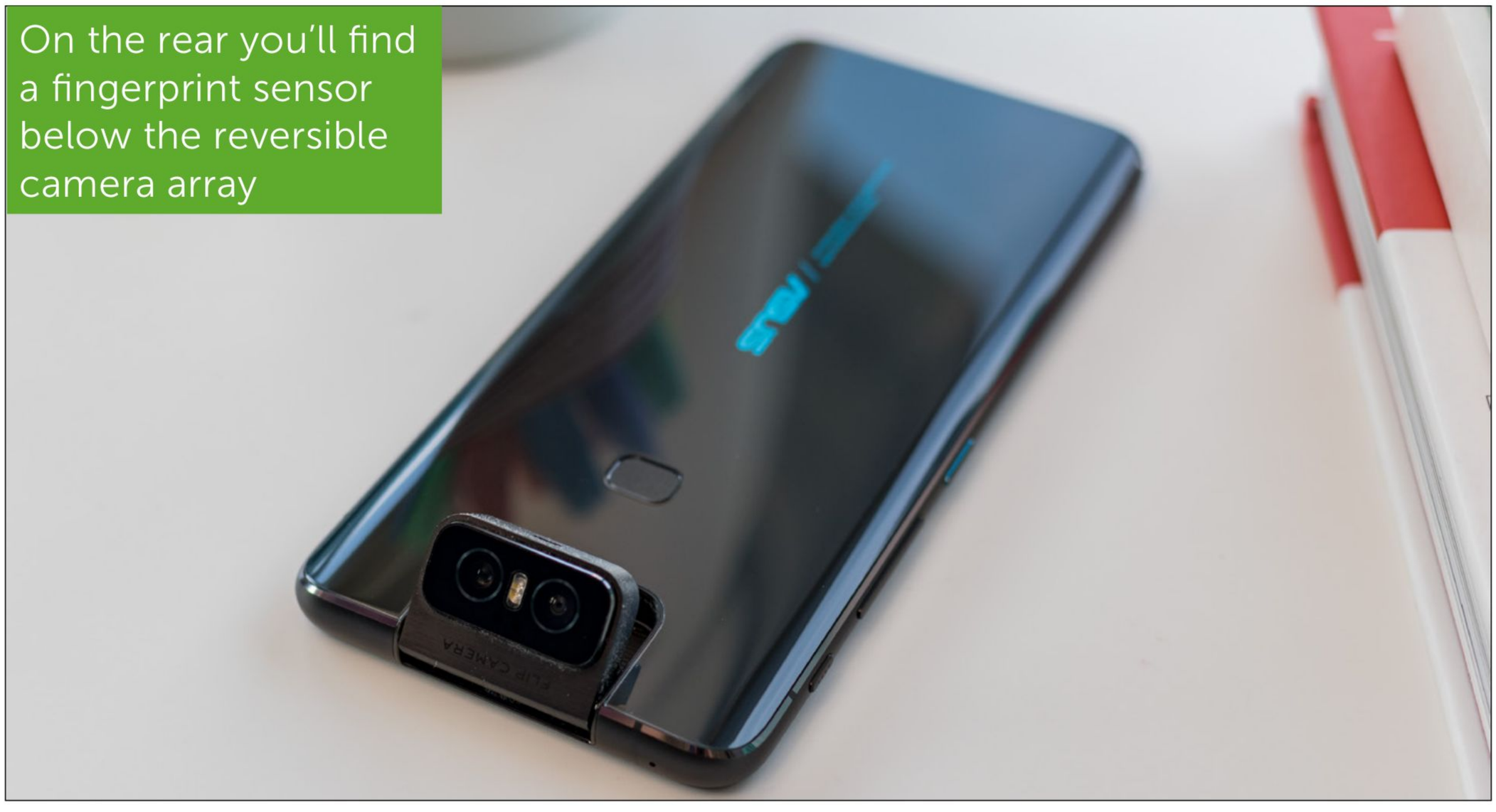
There's also a cool tracking mode that utilizes the flippy nature of the camera to keep the subject

in-shot. Simply tap on screen to select your subject, and the camera will follow it even as it approaches the edge of the capture area. It's the ideal shooting mode for filming fast-moving subjects like children and animals, and works surprisingly well, although you can make out the whir of the motors in the background of quieter videos.

Design

Aside from the camera module, the Asus ZenFone 6 is a sleek bit of kit, featuring a completely bezel-less 6.4in display covered in Corning's sixth-gen Gorilla Glass and a curved rear that fits the contours of your hand, making it comfortable to use one-handed. On the rear, you'll find a standard fingerprint sensor below the reversible camera array, along with Asus branding.

It's admittedly a little chunkier than other smartphones, measuring in at 159.1x75.4x9.2mm and



On the rear you'll find a fingerprint sensor below the reversible camera array

190g, but the curved rear helps negate this to a level where we barely notice the difference.

You'll also notice a 'Smart Key' on the side of the smartphone. This, by default, can be used to summon Google Assistant with ease, but it can be customized to perform a variety of actions, from opening the camera to enabling the torch.

The phone comes in two variants; a rather generic Midnight Black (see opposite), and a more eye-catching white-to-blue gradient nicknamed Twilight Silver, with matching metal band. Oh, and rather importantly, there's not only a 3.5mm headphone port but a notification LED too.

Performance

The ZenFone 6 is certainly a good-looking phone, but it doesn't stop there. Let's talk about that gorgeous HDR10-enabled FHD+ display; it measures in at a whopping 6.4in and offers a tall 19:5:9 aspect ratio. It's bright, crisp, detailed and has an incredible 92 percent screen-to-body ratio.

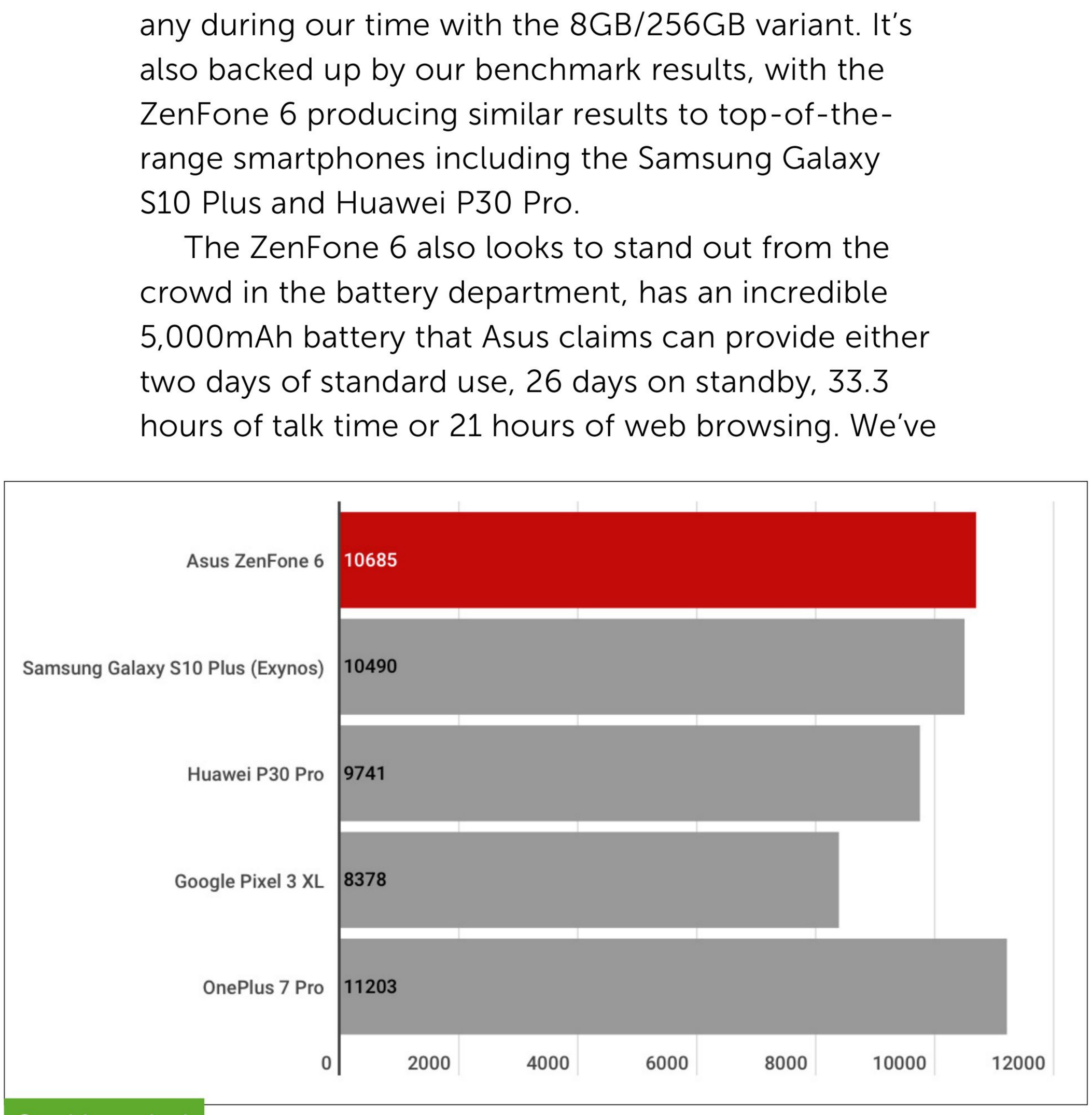
Most importantly, it's free of any thick bezels, notches or hole-punch cameras, giving you an uninterrupted viewing experience that simply isn't offered by the likes of Apple, Samsung or Google. That didn't stop Asus from including stereo speakers to complete the premium experience, though.

Beneath the display, you'll find Qualcomm's latest Snapdragon 855 processor alongside an Adreno 640 GPU, either 6- or 8GB of RAM and 128- or 256GB of UFS 2.1 storage, depending on the variant that you opt for (there's also a cheap 6GB/64GB variant, though

it's not available in the UK and much of Europe). If the built-in storage isn't enough for you, you can expand it by up to 1TB via the microSD card slot.

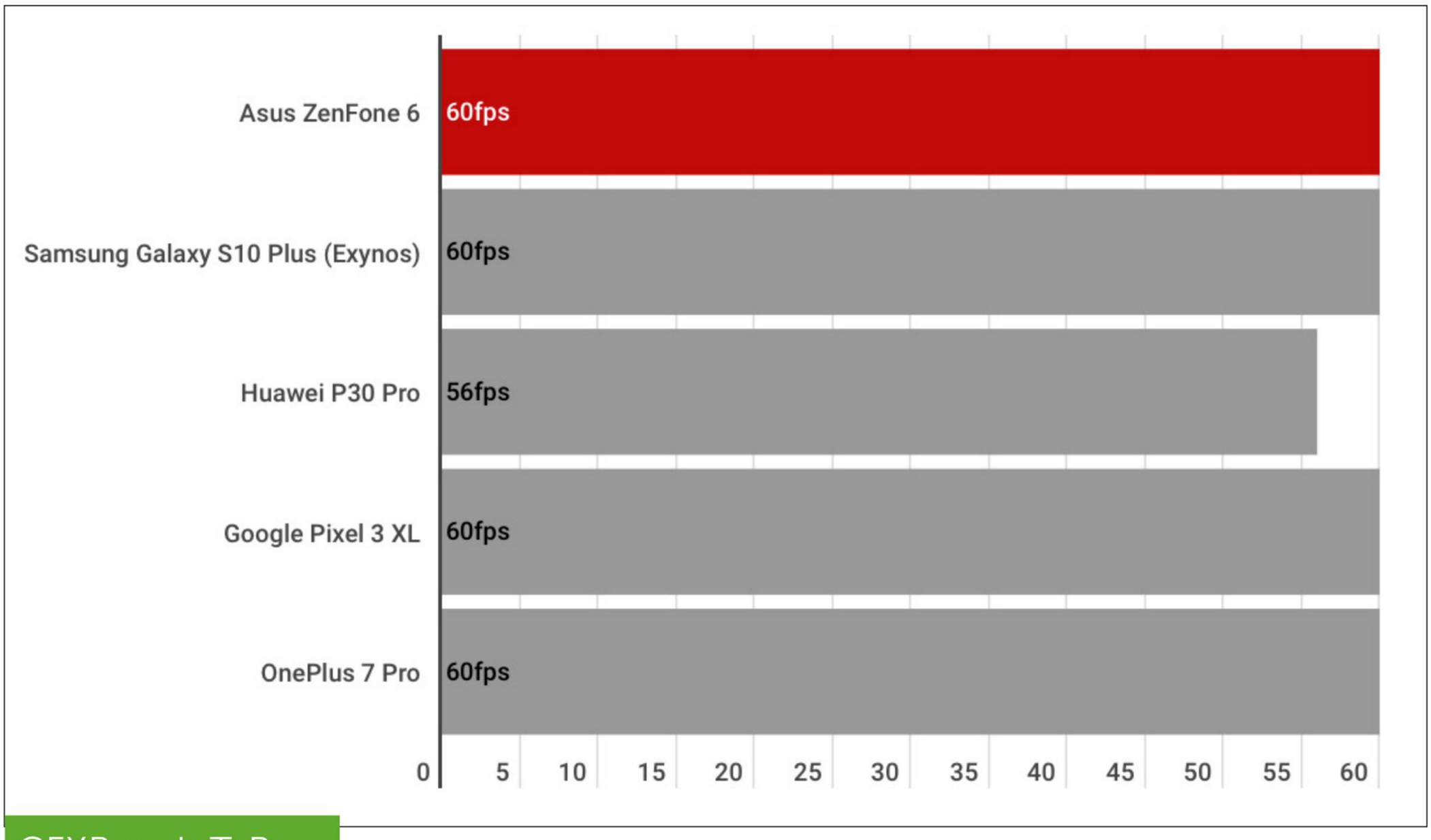
That should be more than enough to power pretty much any app or game on Android with little-to-no lag, and we must admit we've not experienced any during our time with the 8GB/256GB variant. It's also backed up by our benchmark results, with the ZenFone 6 producing similar results to top-of-the-range smartphones including the Samsung Galaxy S10 Plus and Huawei P30 Pro.

The ZenFone 6 also looks to stand out from the crowd in the battery department, has an incredible 5,000mAh battery that Asus claims can provide either two days of standard use, 26 days on standby, 33.3 hours of talk time or 21 hours of web browsing. We've



Geekbench 4

GFXBench Manhattan



GFXBench T-Rex

found that we can get through a 15-hour day with standard usage (browsing, snapping, texting, and so on) and go to bed with around 40 percent battery remaining, and in 2019, that's the dream.

When it does need a top-up, Quick Charge 4.0 can provide users with a speedy charging experience, though, unfortunately, the 18-watt charger isn't included in the box.

The ZenFone 6 is also a powerhouse of connectivity, offering USB-C connectivity with reverse charging alongside the likes of 4G LTE support, Bluetooth 5, dual-band Wi-Fi, NFC, a suite of GPS systems and even FM Radio functionality, although the increasingly-common wireless charging isn't present here.

Software

And, like most other Android-based smartphones being released at the moment, the Asus ZenFone 6 comes with Android 9.0 Pie, though it separates itself from the crowd by guaranteeing an update not only to Android Q, but Android R in 2020 too. It's also a part of Google's Android Beta programme, allowing users to sign up to experimental builds of Android months before release.

Though it may not look like it, the smartphone actually features a custom ZenUI. While it keeps the stock Android look and feel, there are enhancements available to users including the ability to double-tap the display to wake, automatically adjust volume based on the environment, enable a system-wide dark mode and, our personal favourite, the ability

to access the notification shade with a swipe of the rear-facing fingerprint sensor.

Verdict

The ZenFone 6 is one of our favourite smartphones of 2019; rather than following the trend of notches and hole-punch camera cutouts, Asus has implemented an innovative Flip Camera system that provides a high-end shooting experience on the rear and front, without compromising on screen real estate. Images captured are detailed and vibrant, and although the Night Mode doesn't perform as well as some rivals, it's a small gripe in an otherwise impressive camera system. The range of video modes and the ability to record at 4K at 60fps with EIS is a nice touch, too.

Beyond the camera setup, the ZenFone 6 is a stunning bit of kit; it has a curved rear that fits nicely

REVIEW

into the palm of your hand, a glossy design and most importantly, a 6.4in full-screen display free of bezels and notches. And with a 5,000mAh battery that comfortably provides all-day usage, there's not much to complain about. **Lewis Painter**

Specifications

- 6.4in (2,340x1,080; 403ppi) PS LCD capacitive touchscreen
- Android 9.0 (Pie); ZenUI 6
- Qualcomm SDM855 Snapdragon 855 (7nm) processor
- Octa-core (1x 2.84GHz Kryo 485, 3x 2.41GHz Kryo 485, 4x 1.78GHz Kryo 485) CPU
- Adreno 640 GPU
- 6GB, 8GB RAM
- 128GB, 256GB storage
- Dual rear-facing cameras: 48Mp, f/1.8, 26mm (wide), 1/2in, 0.8µm, Laser/PDAF; 13Mp, f/2.4, 11mm (ultrawide)
- Dual front-facing cameras: Motorized flip-up main camera module
- Dual-band 802.11ac Wi-Fi
- Bluetooth 5.0, A2DP, LE, aptX HD
- A-GPS, GLONASS, BDS, GALILEO, QZSS
- NFC
- Fingerprint scanner (rear mounted)
- USB 2.0 Type-C 1.0 reversible connector
- Non-removable 5,000mAh lithium-polymer battery
- 59.1x75.4x9.2mm
- 190g

Best camera phones

Being able to take decent photos is a must for smartphones. We put the best handsets through their paces. JIM MARTIN reports

Cameras are among the most important features of a smartphone for many buyers. After all, their phone is their camera, so their quality can be the deciding factor in opting for one model over another. And given that most phones – especially flagships – are otherwise very similar in terms of performance and screen quality, photography and video is where manufacturers can differentiate their offering from rivals.

ROUND-UP

Our aim with this comparison is to reveal which phone has the best cameras for taking photos, videos and selfies. You won't find every flagship phone here, as we're including only those which have cameras good enough to be called 'the best'. That isn't determined by specs or features, it's judged by the quality of the photos and videos they produce.

How we test

Rather than using controlled conditions and attempting to compare the cameras scientifically, we took photos and videos just as anyone would. That means using the default settings out of the box and taking pictures hand-held, not with a tripod.

The only settings we changed were to turn off any beauty modes on the selfie cameras, and to choose the highest resolution and frame rate for the video samples. Most manufacturers make 1080p at 30fps the default setting because it uses so much less storage space, but this is far from the best quality available: all the phones here will record in 4K.

Camera tests

We've kept the comparisons to the core functions: photos with the main camera (including portrait modes with blurred backgrounds), selfies and videos. Extra modes, or the lack of them, have no impact on our verdicts.

Camera apps

The experience of taking photos is almost as important as the results, so the stock camera app is a key factor

in our reviews as this can make the difference between a phone that's a joy or a pain to use as a camera.

Subjectivity

Our hope is that you end up with a very good idea of how each phone's cameras perform in the real world, but judging image quality is inherently subjective. Some people prefer processed images which are sharpened and have saturated colours, while others prefer a more natural look. Plus, the screen on which you view the photos and videos has an influence, too.

That's why we've uploaded the original files from each phone so you can view the full-size photos and videos and decide for yourself – bearing in mind your own priorities – which phone you should buy. We'll provide the link in each review.

Specifications

	Google Pixel 3/3 XL	Huawei P30 Pro	Samsung Galaxy S10+	Xiaomi Mi 9
Rear camera(s)	12.2Mp	40Mp, 20Mp (wide), 8Mp (5x zoom), Depth	12Mp + 16Mp (wide), 12Mp (2x zoom)	48Mp + 16Mp (wide), 12Mp (2x zoom)
Front camera(s)	8Mp + 8Mp wide	32Mp	10Mp + 8Mp	20Mp
Video (highest quality)	4K at 30fps stabilized	4K at 30fps stabilized	4K at 60fps, not stabilized	4K at 60fps, not stabilized
Special features	Top shot, Super Res Zoom, Night Sight	Night mode, light painting, 960fps slo-mo, Cinema AI	960fps slo-mo, HDR10+ video	Night mode, light effects

Drawing conclusions

Rather than judge the photos by viewing them on each phone's screen independently, we opened in them in Photoshop on a calibrated Philips Brilliance 272P. This is a 27in 4K display which allowed us to see all the detail in 4K video. Bear in mind that your own display may have a lower resolution, and may not produce accurate colours.

Best camera phone

Winner: Huawei P30 Pro

The P30 Pro has the best cameras of any phone right now. The main rear camera is simply amazing, able to take fantastic photos even in very low light. The other cameras can't match it for quality, but add huge versatility. The ultra-wide camera is great when you're shooting indoors or for landscapes, but it's the 5x optical zoom that impresses most.

Like every phone here, the P30 Pro isn't perfect: the screen has a lower resolution than we'd like for the price and the mono speaker feels like a step backwards. Video quality is improved, but still lags behind the best (Xiaomi Mi 9). But if you can live with those things and you take more photos than videos, the P30 Pro will not disappoint.

Runners-up

Although we didn't include it in this round-up, Huawei's Mate 20 Pro is almost as good, and if you're not bothered about a zoom or a wide-angle camera, Google's Pixel 3 and Pixel 3 XL delivers sharp and detailed pictures.

Xiaomi's Mi 9 easily deserves to be in this comparison, and is capable of fantastic photos and stunning video.

And it's no surprise to see the Galaxy S10+ as our new favourite from Samsung: it's the first to sport a triple rear camera, so bests the S9 if you're keen to have a wide-angle as well as telephoto lens.

Also consider

The models mentioned above are the best, but if you can't justify buying a flagship phone, here are some cheaper alternatives that we've tested and been impressed by:

- OnePlus 6T
- Samsung Galaxy S9
- Honor View 20

Samsung's Galaxy S9 is a good alternative if you are looking for a cheaper model

ROUND-UP

- Google Pixel 2
- Huawei P20

1. Huawei P30 Pro

Price: £899 from **fave.co/2I5D3Yp**
Test images: fave.co/2Wdlv6y

Huawei is now in a leading position for smartphone photography, having changed opinions with the impressive P20 Pro and then the building on that success with the Mate 20 Pro.

The P30 Pro steps it up another notch with a 5x optical zoom using a periscope arrangement. It then adds a fourth camera that's dedicated to detecting the depth of objects in the scene. One of the advantages of the system is that the P30 Pro is able to use its main camera for portrait photos and therefore offers the

It's impossible not to be impressed by the detail the P30 Pro can capture

same field of view. Most of its rivals zoom in which, while not a damning problem, can be a bit irritating.

However, it's the zoom capabilities that really set the P30 Pro apart. If you think a 2x telephoto lens is adequate, you'll quickly change that opinion once you've use the P30 Pro's 5x lens.

As before, there's a hybrid mode that uses the extra detail available from the main 40Mp sensor along with the 8Mp sensor behind the periscope lens to offer what Huawei terms 'lossless 10x zoom'. It's a different way of doing things than Google's Super Res Zoom. We think it's more effective, but it's obvious just from looking at the photos at 1:1 in Photoshop that it is not lossless.

Close scrutiny aside, it's impossible not to be impressed by the detail the P30 Pro can capture. In our sample shots, we use St. Pancras Renaissance Hotel (see overleaf) and there's a surprising amount of detail and clarity in the 10x photo. Even at 5x, the P30 Pro blows everything else here out of the water: there's simply no contest from the 2x zooms.

What's even more impressive is when you consider the range on offer, from the 16mm equivalent ultra-wide-angle lens to the 125mm equivalent 5x telephoto: no other phone is that versatile.

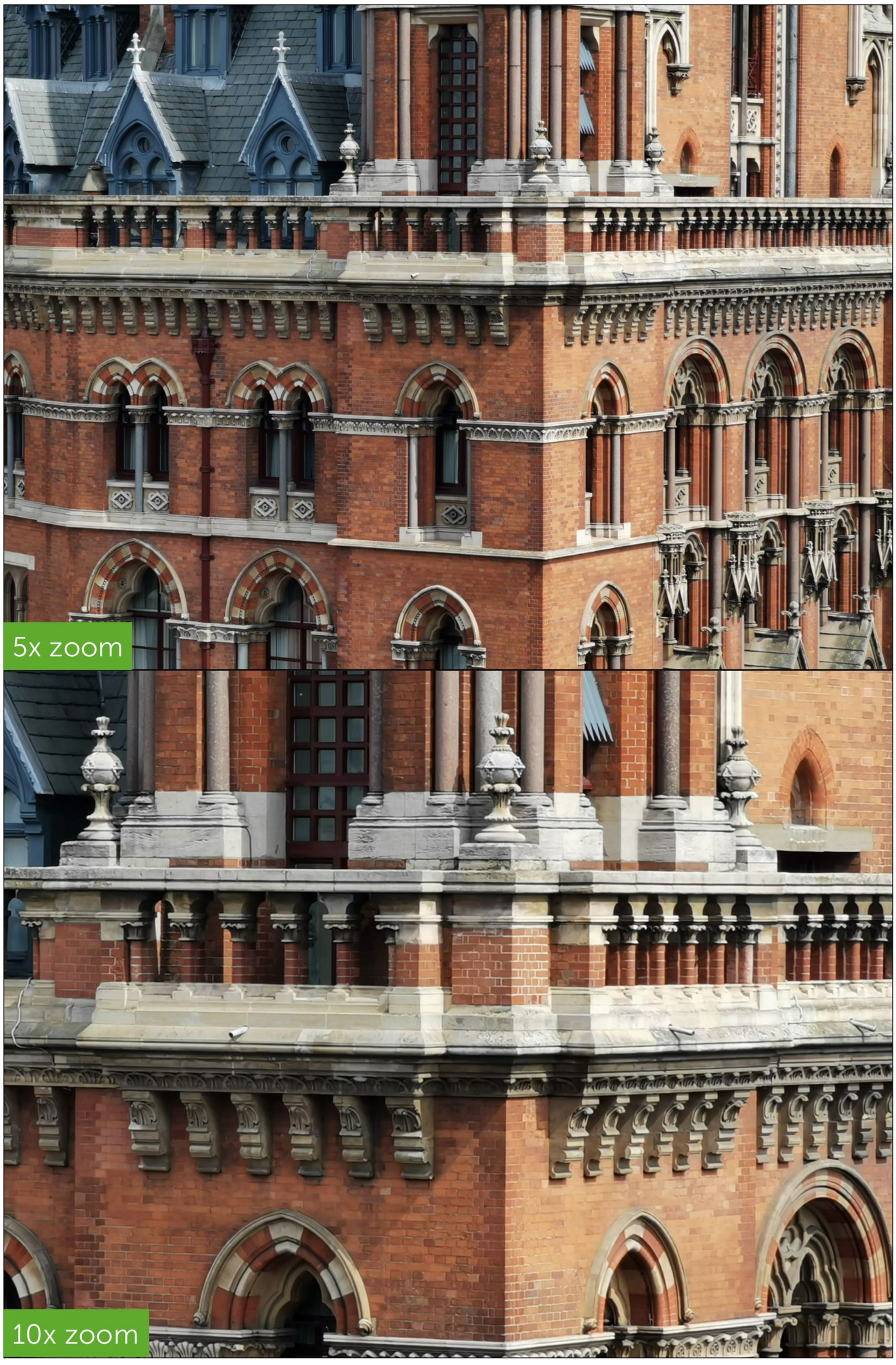
By default, Master AI – the 'artificial intelligence' image processing – is switched off, and for the most part you'll probably leave it that way. There's still a tendency to over-saturate everything when it's on, but not to the extent that it did on the P20 Pro.

What we haven't even talked about yet is the upgraded 40Mp 'Super Sensing' camera. Huawei

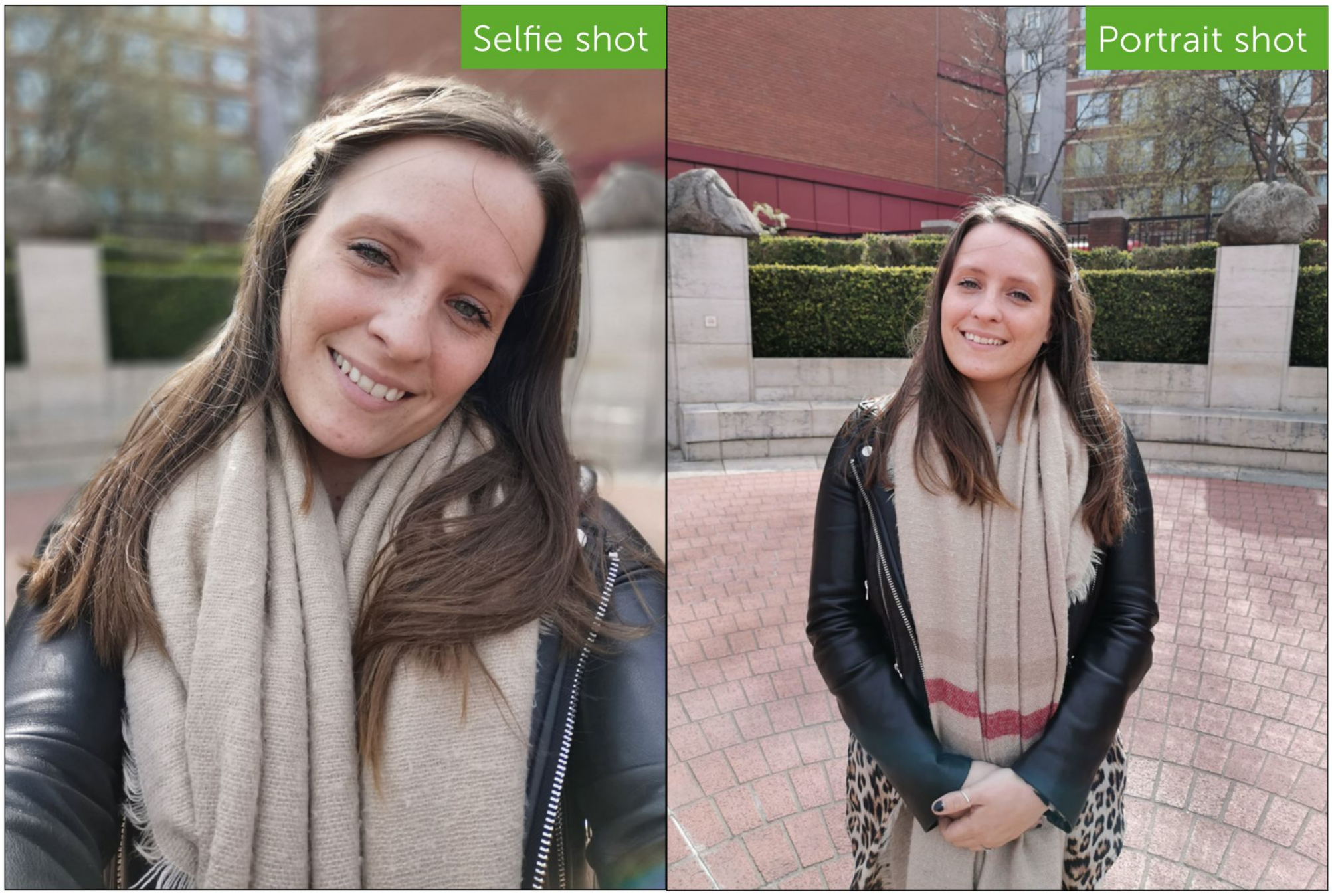
ROUND-UP

Standard shot

Wide-angle shot


5x zoom
10x zoom

ROUND-UP



ditched the traditional RGB sensor for one with two yellow sub-pixels instead of green. That's because yellow is more sensitive to light and it makes the sensor able to capture 40 percent more light.

So in addition to taking sharp, detailed images during the day, it's possible to shoot astounding photos in the dark, even if you have shaky hands. The Night mode works in a similar way to the P20 Pro's, combining a selection of photos taken over a period of 8 seconds. So, yes, we've seen it before (and the Pixel 3 brought us Night Sight). However, the super-high sensitivity means you can get colourful images even when it's almost pitch black. Frankly, it's magic.

The main camera is the one to use for the majority of the time as it delivers the best photos. On the

sample phone Huawei provided for this test, photos from the ultra-wide camera had noticeably different colours to those from the main and telephoto cameras, being darker and more saturated.

That's most annoying when you're shooting video and you switch from the main camera to ultra-wide, as the colours visibly shift.

The Apple-like camera app is easy to use, but is packed with a few too many settings and features. One feature we wish it had was auto HDR. But no. Even though Huawei has improved the HDR mode on the P30 Pro, it remains a separate mode of its own which you have to switch to manually. And so, for the vast majority of the time, you won't use it – a shame as it's very good.

The P30 Pro is Huawei's first phone to offer stabilization in 4K, but there's still no option to record it at 60fps. Video quality is very good (see **fave.co/2Wqd1Z2**), with lots of detail and good stereo sound. Stabilization isn't great in 4K, sadly, so you may want to stick to 1080p or invest in a phone gimbal.

As if 24Mp weren't enough for the front camera, Huawei has upgraded it to 32Mp on the P30 Pro. And it does take a good selfie, but we couldn't see a whole lot more detail than the P20 Pro's 24Mp camera. Look up close and details are smeary (see **page 63**), as you tend to see when there's heavy noise reduction going on, but it's possible there's some 'beauty' processing even when the slider is set to zero as it was for the selfies we took here.

So, the P30 Pro isn't perfect: the ultra-wide and zoom cameras each have their flaws. But overall

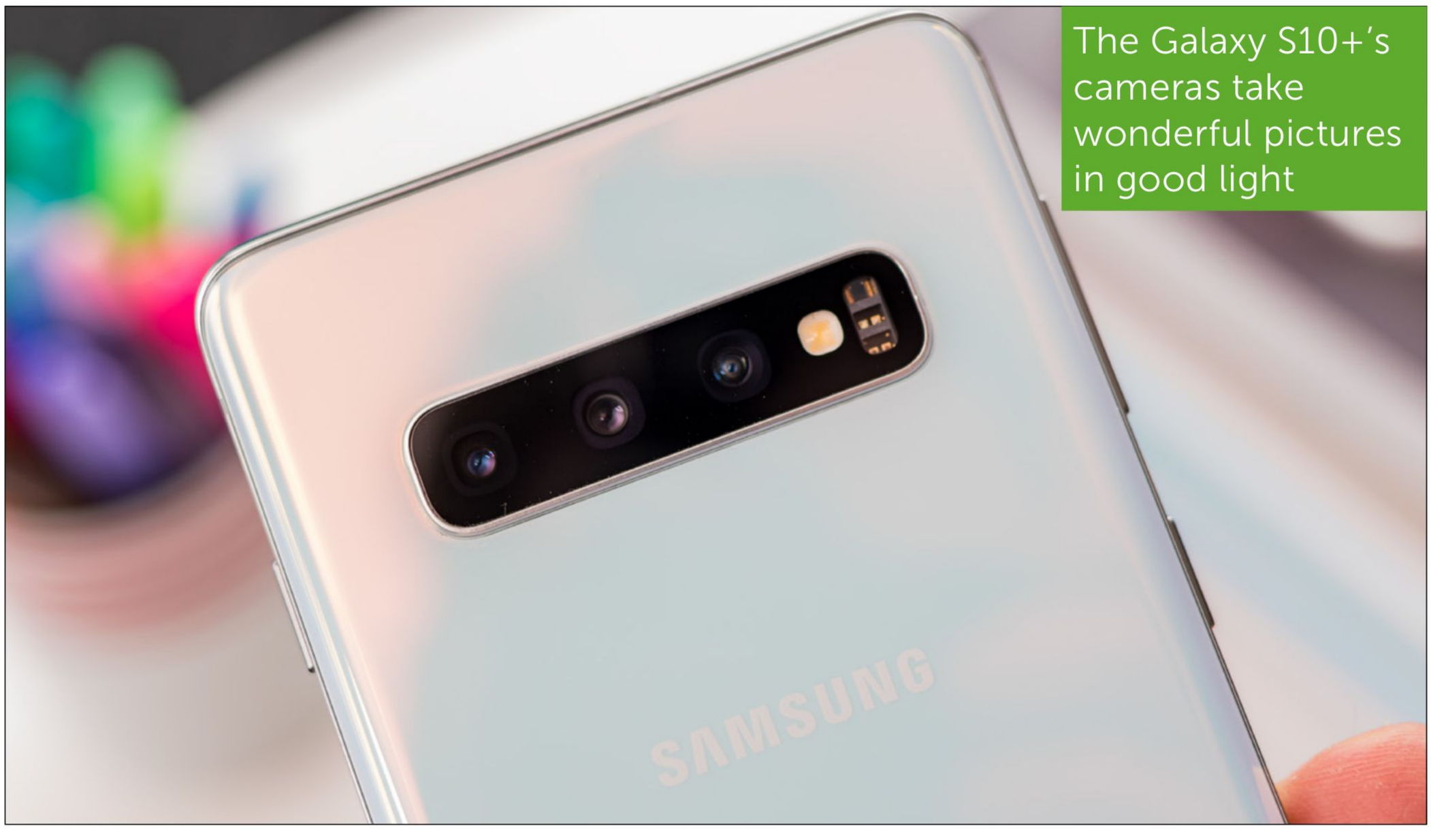
the versatility and fact that you can zoom in and get detail where other phones can't, as well as shoot in impossibly low light makes this our pick of the bunch.

2. Samsung Galaxy S10+

Price: £899 from **fave.co/2WyVsG0**
Test images: fave.co/2I6wtAP

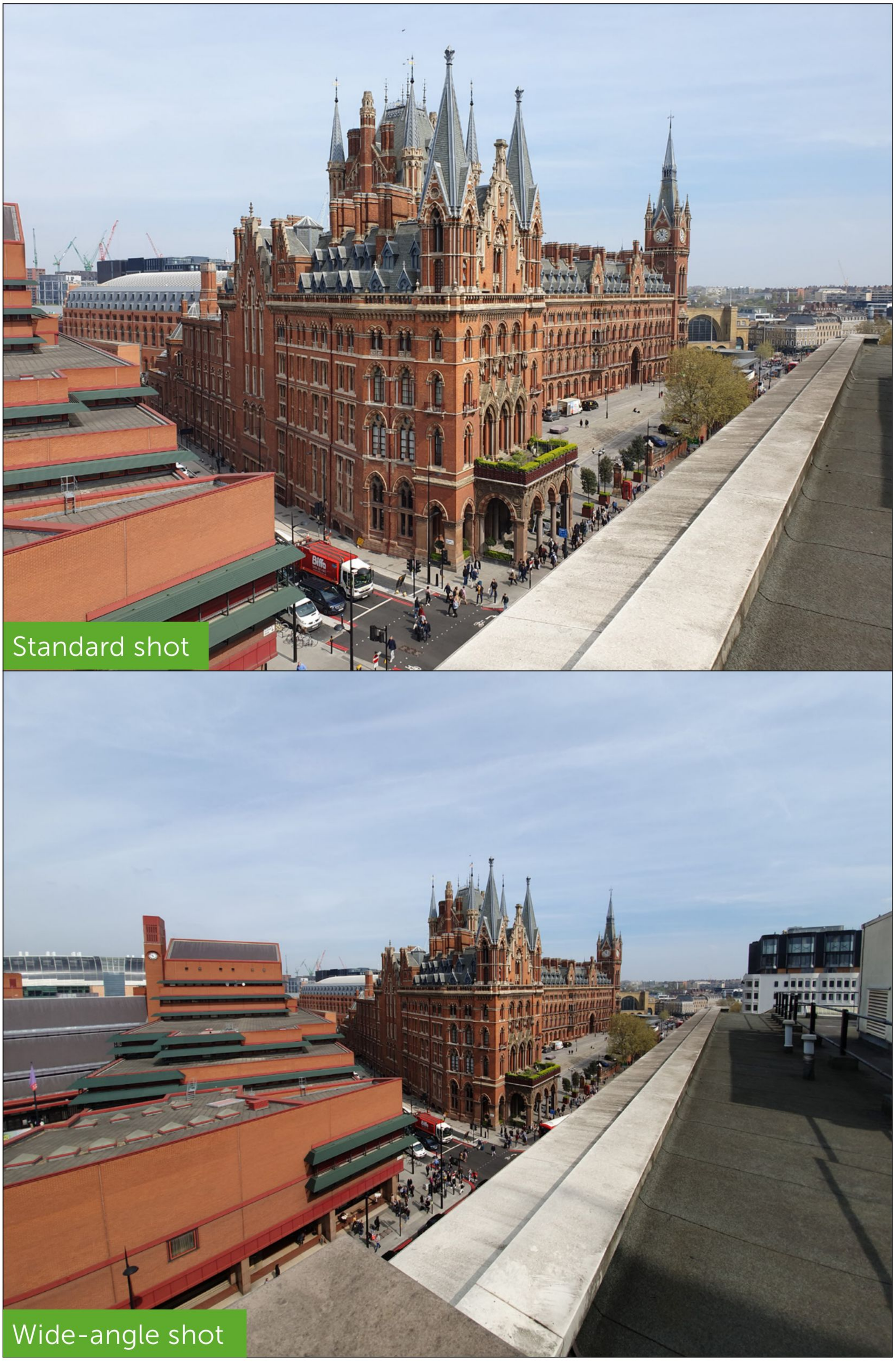
The S10+'s cameras are quite different from the S9+'s. Instead of minor tweaks, Samsung has added a third camera to go with the 12Mp main and 12Mp telephoto ones. It's an ultra-wide one with a 16Mp sensor, meaning the S10+, and regular S10, which shares the same rear camera setup, now have a bigger range than ever before.

The main camera is basically the same as you'll find in the Galaxy S9. Its iris can switch between two



The Galaxy S10+'s cameras take wonderful pictures in good light

ROUND-UP



Standard shot

Wide-angle shot

apertures: f/1.5 (bigger) and f/2.4 (smaller). That's useful as it can open up to let in more light at night, and close up in bright light to offer sharper photos.

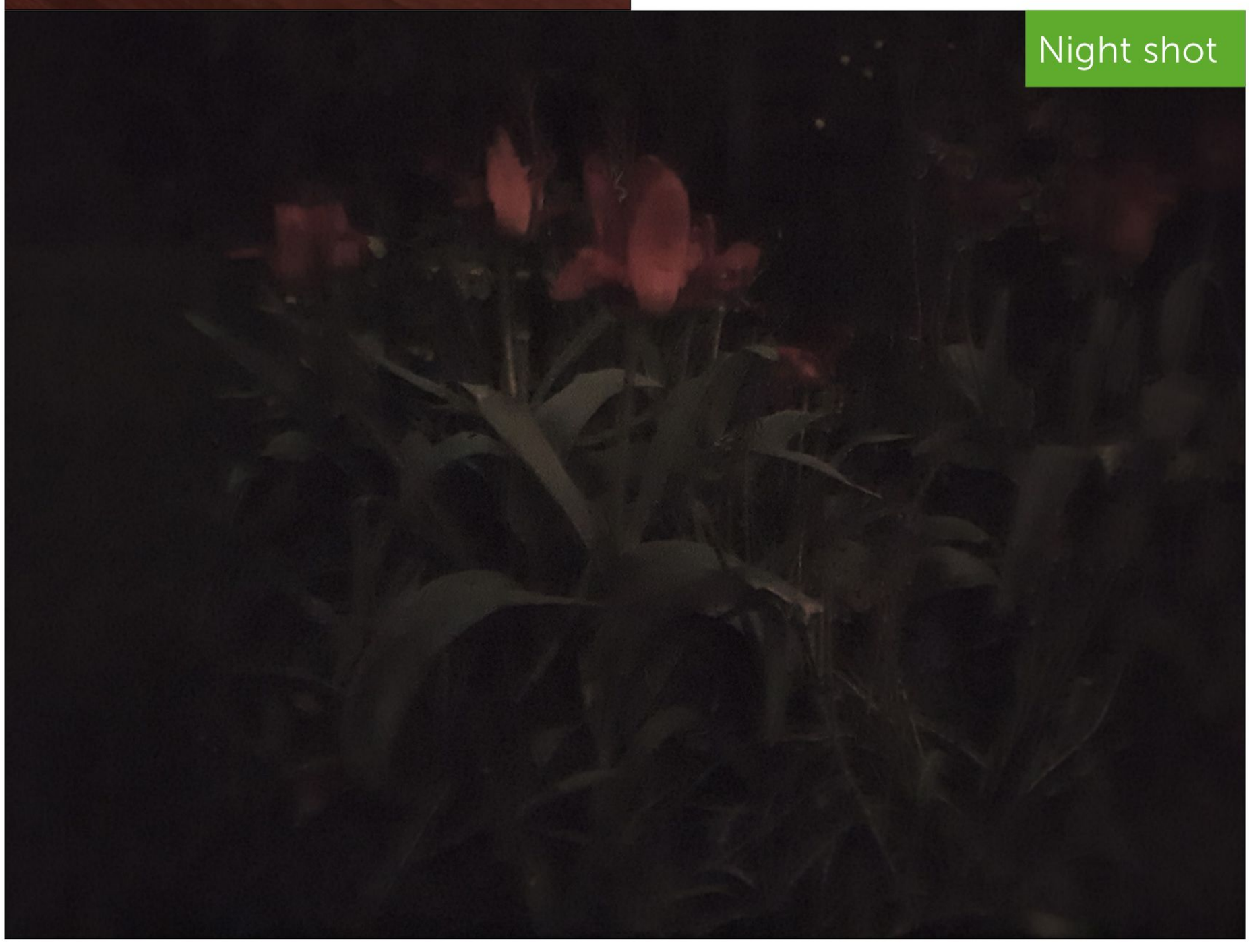
The telephoto camera is also the same, with a 2x zoom and optical stabilization. The newcomer gets a 16Mp sensor and a wide-angle lens which is the 35mm equivalent of 13mm with an f/2.4 aperture.

Given how good the S9's cameras were, it's no surprise to see similarly good quality from the S10+'s photos. They have great dynamic range, so there's lots of detail in both shadows and highlights. Auto HDR means you don't have to think about whether you need to enable this setting or not.

White balance is generally reliable so colours are very good in just about all lighting except when it's

really dark. Zoom in on a big screen and there's a lack of sharp, fine detail, but this is a minor complaint. You won't notice the effect of the variable aperture, as it'll mainly stick to f/2.4 in daylight.

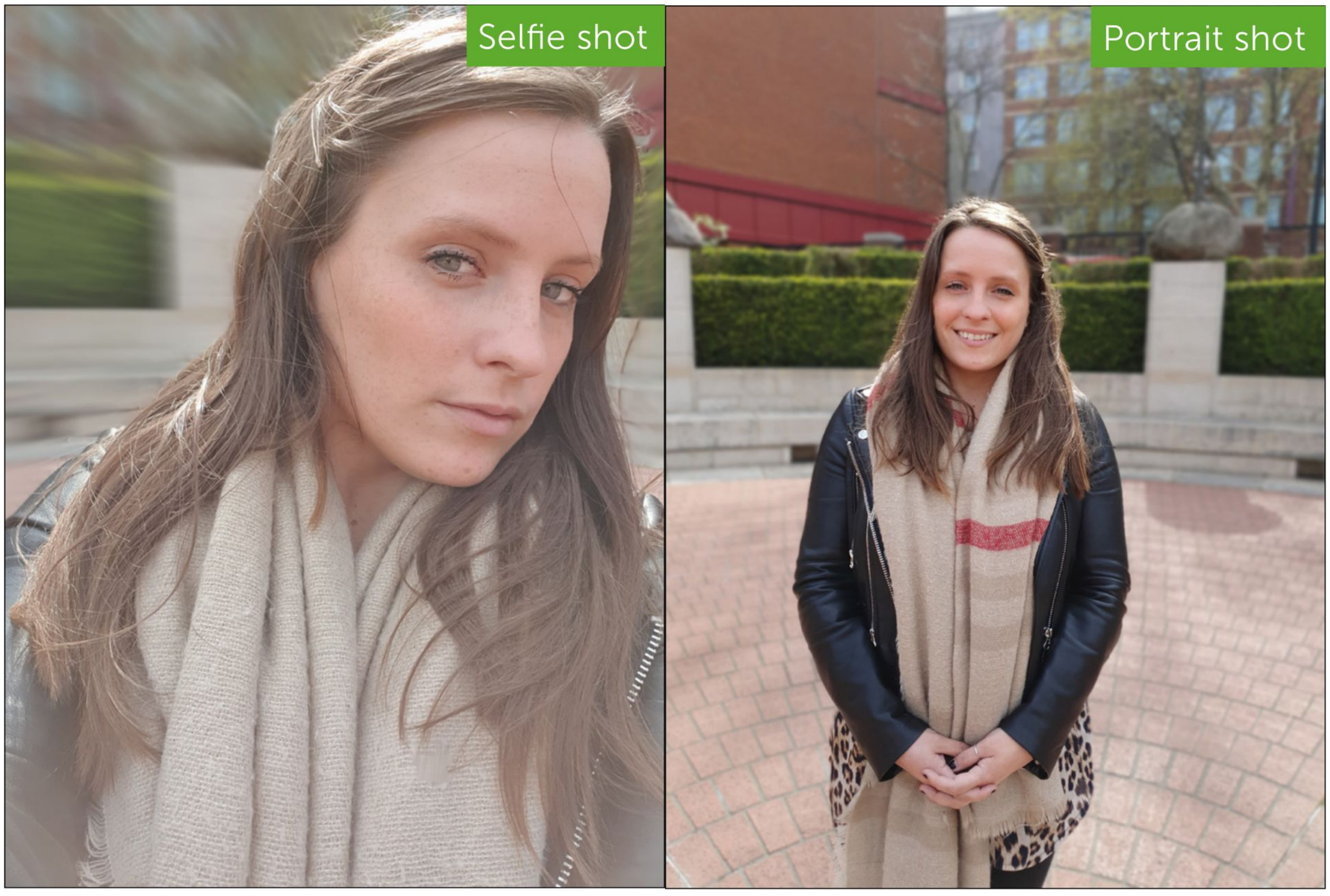
The 2x zoom works well enough but obviously can't compete with the P30 Pro's 5x lens. As with the main camera, exposure, white



balance and colours are very good. Images shot with the ultra-wide camera obviously lack detail when you zoom in, but there's no obvious drop-off in sharpness as you often find at the edges of the lens.

In portrait mode, the S10+ uses the same field of view as the main camera, and does a good job of depth detection. There's a more realistic gradient to the blurring from foreground to background that makes the S10's portrait photos more convincing than from other phones. But it still can't adequately isolate wisps of hair, as any close examination will reveal.

For video, the S10+ offers great stabilization in 4K, but not if you choose to record at 60fps. However, you're no longer limited to five minutes per clip as with the S9. Another upgrade from the



S9 is a beta option to record video at up to 4K at 30fps in HDR10+, which is great if you have a TV that supports this standard. Just viewing HDR video on the S10+'s screen, the difference was obvious to see with better contrast and colours. You can see our test video at **fave.co/2Mfgg1z**.

The camera app uses the same format as most others, so you swipe between the various modes. Usefully the settings allow you to customize which modes are shown, so you can remove 'Food' and others that you don't use.

Where the S10+ struggles is in low light. There's no night mode and no hand-held long exposure mode. This means you'll end up with blurry photos if you select a long shutter speed in the Pro mode, although if you're determined you could use a tripod.

The dual front cameras could easily be mistaken for a standard and wide setup as on the Pixel 3, but the right-hand lens is purely for depth detection. There's an option for a wide selfie, but it's nothing like the difference you get with Google's phone.

Selfies are pretty good, though, and the depth camera certainly seems to improve subject isolation. There are various modes available in the 'Live Focus' mode, including Zoom, which we used for the portrait selfie in the gallery here.

Overall, the S10+ has excellent cameras. It takes wonderful photos in good light which are on a par with the best here. Its strengths include great portrait modes for both front and rear cameras, and great video stabilization (plus the capability to record in HDR10+). The zoom is much more limited than the

P30 Pro's, as are the S10+'s low light capabilities. But if you prefer to buy Samsung rather than Huawei, the S10 and S10+ are fine choices.

3. Xiaomi Mi 9

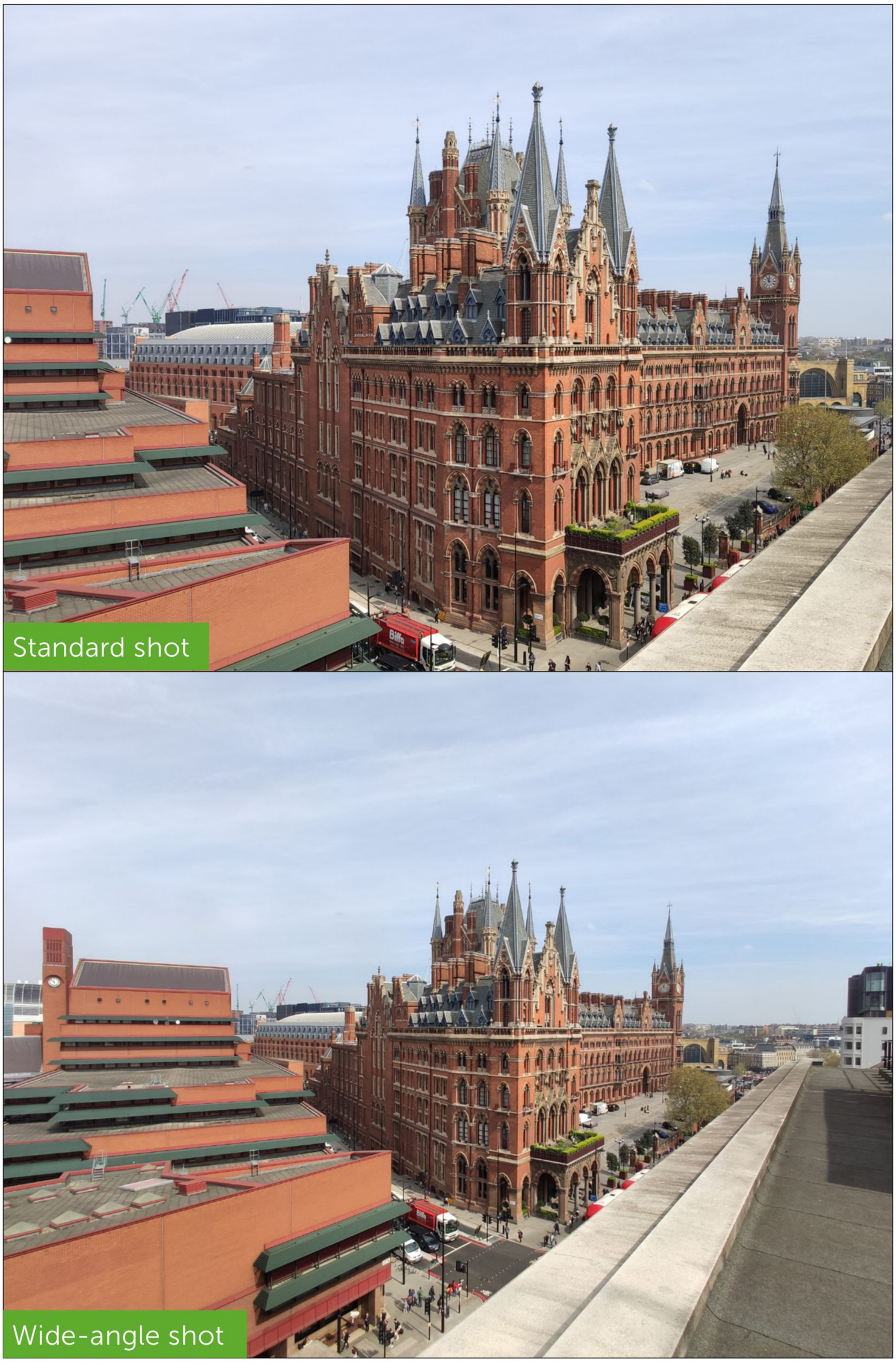
Price: £499 from **fave.co/2I4hG9Q**
Test images: fave.co/2I8bltM

Xiaomi has been playing catch-up to Huawei for a while, but in the Mi 9 it has produced something special. This is a phone that can compete with Huawei's best, as well as Samsung and Apple. The same is true for the Mi 9's cameras.

The triple rear setup is a first for Xiaomi. It's very similar to the Galaxy's S10+'s with an ultra-wide camera and 2x telephoto, but the 48Mp main sensor steals the show. This works in the same way as Huawei's 40Mp sensor: it uses a pixel-binning

The Mi 9's cameras are highly impressive

ROUND-UP



Standard shot

Wide-angle shot

Telephoto shot

technique where a group of four pixels are treated as one, with colours averaged across them (and other information) to produce a top-quality 12Mp photo.

And you need only look briefly at those photos to see that the Mi 9 is capable of fighting it out with the big boys. Exposure is spot on, colours are natural (white balance is generally reliable) and detail is very sharp. It's only when you really zoom in examine photos in Photoshop that it becomes evident that fine details are slightly soft compared to the P30 Pro, but this is a very minor complaint.

What's arguably more impressive is that the Mi 9's photos are better than Apple's iPhone XS's. Thanks to that high-res sensor there's more detail and noise is kept under better control, especially in low light.

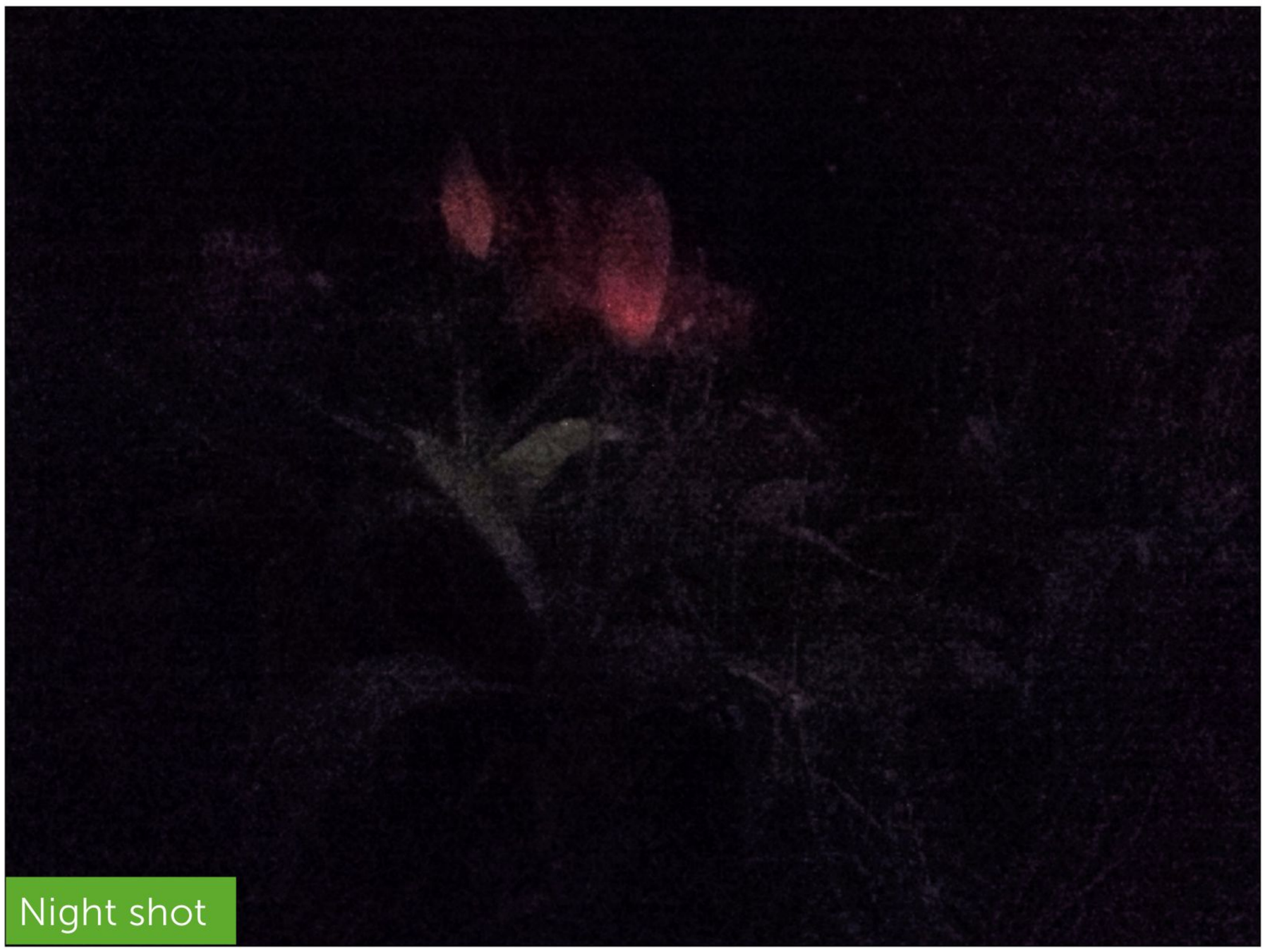
ROUND-UP

Low light shot

Night Mode low light shot

Selfie shot

Portrait shot



Night shot

The Mi 9's telephoto lens is also better, resolving more detail than Apple's. We're particularly impressed by the Mi 9's portrait mode, which does a brilliant job of isolating the subject from the background for convincing bokeh. Plus, you can adjust the effect when editing a photo in the camera roll, just as you can on the iPhone XS.

Another of the Mi 9's strengths is video (see **fave.co/2I51Hs2**). It defaults to the usual 1080p30, but you can change this to 4K at 30fps or even 4K at 60fps. You won't see any messages about features that are disabled when you do this: the stabilization option remains active even at 4K at 60fps.

However, we found that it was pretty ineffective in that mode, but at 4K at 30fps you can expect excellent

results: smooth, detailed footage with very little noise. Autofocus performance is exemplary and changes in exposure aren't jarring. Stereo audio is pretty good as well and has decent dynamic range.

Xiaomi's camera app is intuitive to use. There are a couple of extra modes, but the Night mode isn't up to much when it's really dark. In very low light it will take a long exposure, but the results are unimpressive: it can't compete with the P30 Pro or Pixel 3. However, in moderately low light, there's a noticeable improvement as you can see in the shot of our scene-in-a-cupboard where there's a lot more detail in Batman's costume and a lot more shadow detail.

Round the front is a 20Mp selfie camera. It captures plenty of detail and even does a good job of portrait photos, again with very good isolation of subject and background.

Overall, the Mi 9's cameras are highly impressive. The zoom isn't as capable as the P30 Pro's and it isn't as good in very low light but if the Mi 9 takes your fancy (especially its low price), then you won't be disappointed with its photos or video.

4. Google Pixel 3

Price: £739 from **fave.co/2WahEHq**
Test images: fave.co/2I9upYI

The Pixel 3 and Pixel 3 XL have the same cameras. Although the hardware isn't that fancy, with just one rear camera, don't make the mistake of thinking it's no good. Far from it. With Google's 'Computational Photography' and the Visual Core chip there's a lot

The Pixel 3's main camera takes outstanding photos

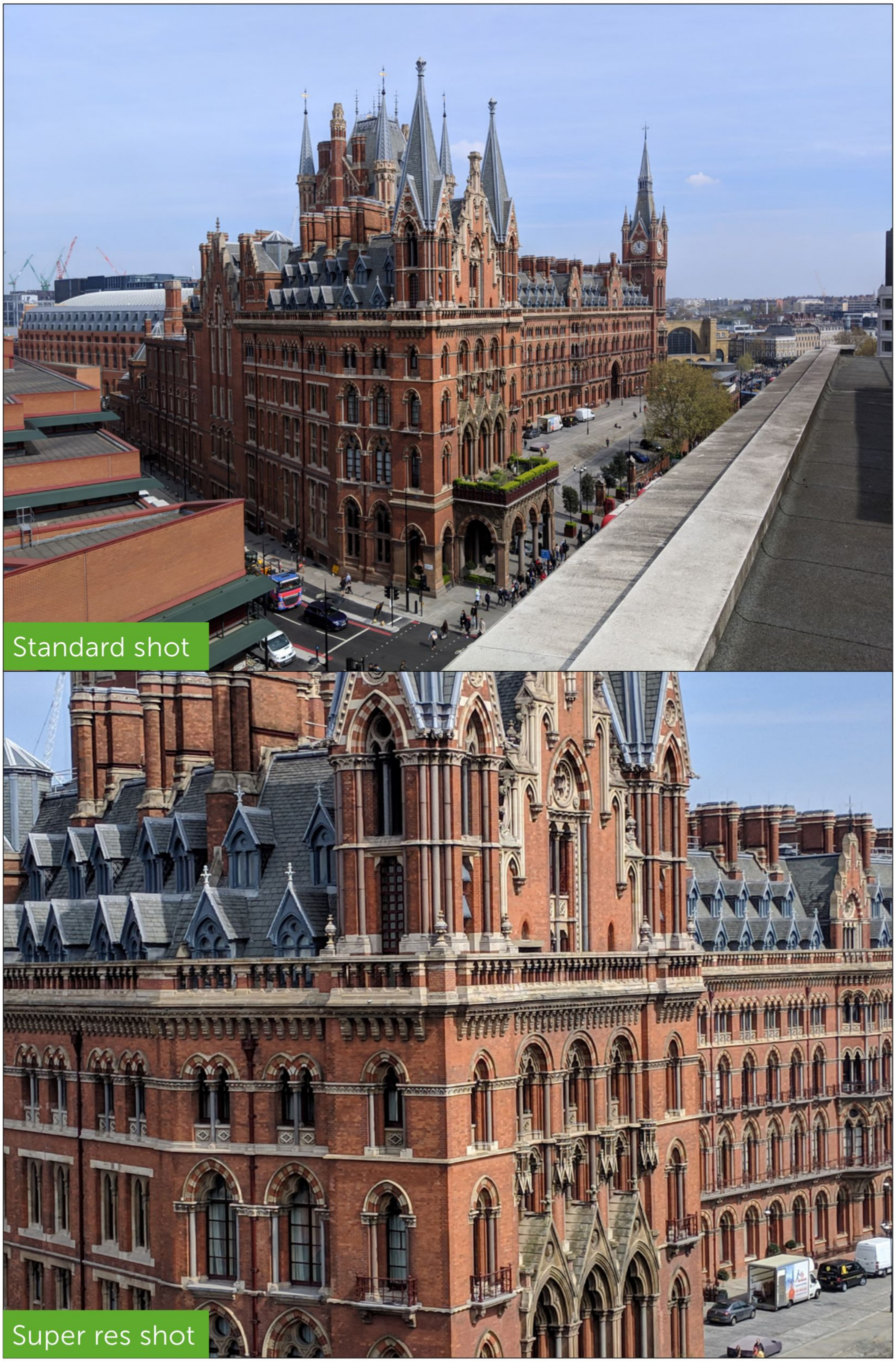
of clever processing which makes for some great-looking photos and videos.

Starting with the hardware, the main camera still has a 12.2Mp sensor, a Sony IMX363. There's no laser focus (as the Pixel 2 had), but phase detection is used to good effect: auto focus is still very fast even in dim light.

Software features are the highlights here: Super Res Zoom, Night Sight and Top Shot. Super Res Zoom takes several photos and uses the slight differences along with Google's computing power to intelligently create pixels for a better-quality photo than mere interpolation would create.

Night Sight works in a similar way to create a correctly exposed image rather than one which is too dark. The exact technique hasn't been revealed but the results speak for themselves. It's possible to get some

ROUND-UP



Standard shot

Super res shot

fantastic results in dark conditions so long as there's no movement in the scene beyond your shaky hands.

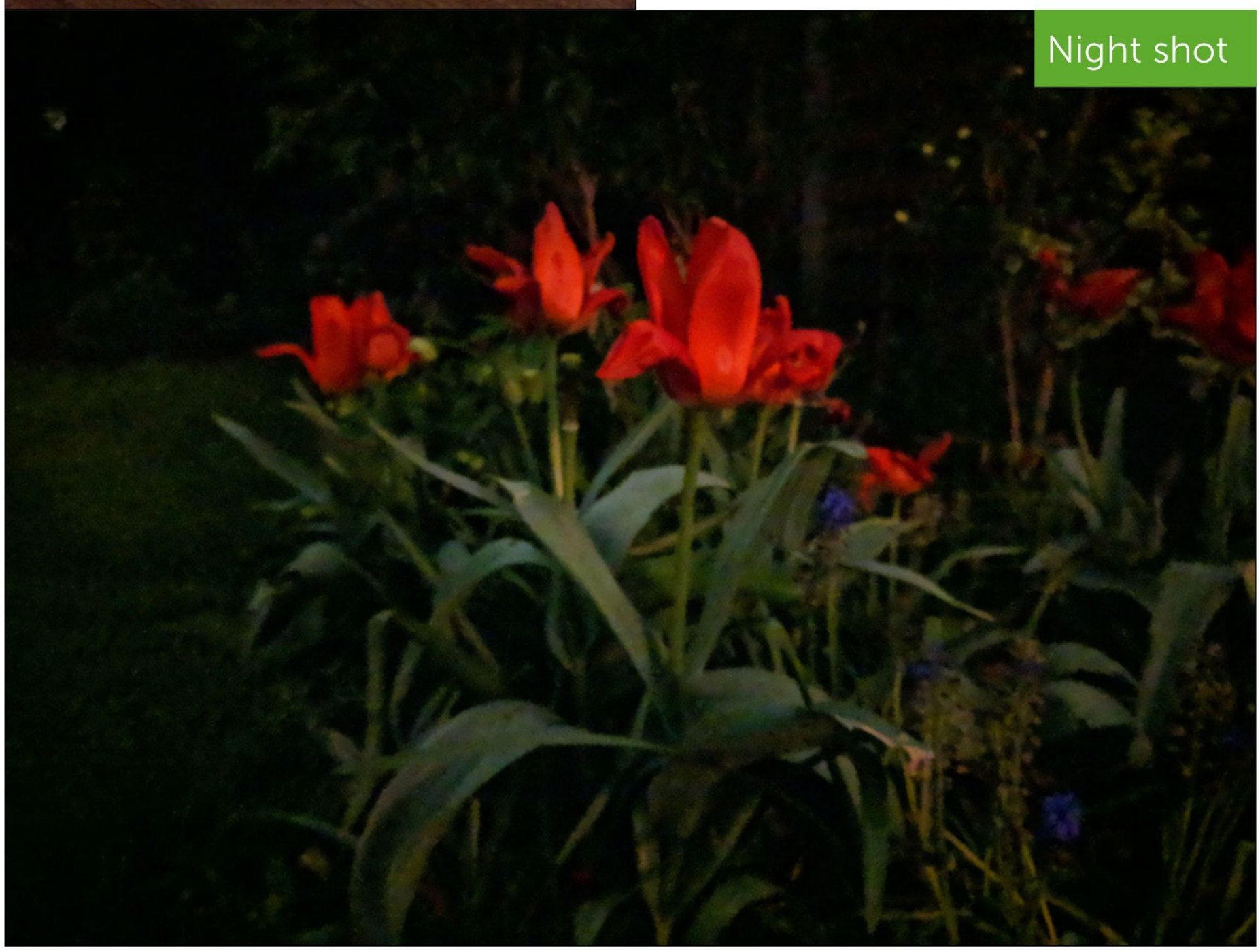
Top Shot shoots a series of photos and automatically selects the best one and eliminates any where a person's eyes were shut or not smiling. And it works really well. It doesn't always trigger, though, even if you think it should have.

In good light, the Pixel 3's photos are just as amazing as you'd expect. Detail is crisp, white balance excellent and – thanks to HDR+ – dynamic range is impressive. Despite the single camera, portrait shots are very good and the blurry backgrounds look authentic, with subject isolation generally accurate. It is easy to spot errors, though, and a trained eye will immediately know it's 'faked'.

ROUND-UP

Low light shot

For all the software smarts, the Pixel 3 now lags behind its rivals, which are sprouting more lenses than ever before. Super Res Zoom works as advertised, but only to a point. It isn't quite up to the standard of phones with a 2x optical zoom and certainly can't compete with 5x periscope lens on the P30 Pro (nor, indeed, the 3x telephoto on



Night shot

Huawei's P20 Pro and Mate 20 Pro). And, of course, it lacks a wide-angle lens for landscape shots, so you'll have to use the panorama mode.

The camera app is a pleasure to use. But the slider doesn't tell you the zoom factor, so we've approximated a 2x zoom, as well as 5x and 10x to match the P30 Pro. In these shots, the deficit becomes obvious where the brickwork of St. Pancras Renaissance Hotel becomes a blur.

Since the Pixel 3 isn't noticeably cheaper than its rivals, we can't help but wish Google had spent the money invested in Super Res Zoom on a second sensor and lens.

In fact, Google did spend go for an extra sensor and lens, but it's on the front. This is no doubt because

plenty of people now take more selfies than anything else. So in addition to the standard selfie camera there's also a wide-angle one. Both have 8Mp sensors, but with the great image processing that's enough detail for good-looking photos.

You don't choose which camera to use: there's a zoom slider that goes from wide-angle to zoomed-in and portrait mode works at any point in the range. The wide angle setting is great for group photos, but it does make the Pixel 3 better suited to people who prefer to take selfies rather than pictures of others.

Video capture is exactly the same as the Pixel 2, shooting 4K at up to 30fps. Stabilization is a combination of electronic and optical and works at all resolutions. It's a shame that 60fps isn't available at 4K and that Google still hasn't improved the slo-mo options: you're still limited to 120fps at 1080p and can only shoot 240fps at 720p. However, the Pixel 3 does gain a flicker sensor, which eliminates the shimmering effect you get from indoor videos shot under artificial light. You can see our test video at **fave.co/2WesUSR**.

There are benefits of buying the Pixel 3 including the fact that you get free, unlimited storage on Google Photos for photos and videos at full, original resolution. This lasts until 31 January 2022, and could save you a fair amount on cloud storage.

Although you can criticise Google for certain decisions about the Pixel 3's cameras and capabilities, the main camera takes outstanding photos. If you don't want or need the extra cameras and features available on other phones, the Pixel 3 is still a great choice for photography.

COMPARISON

Google Pixel 3a and 3a XL vs Pixel 3 and 3 XL

Everything that's the same and everything that's different.
MICHAEL SIMON reports

For the first time ever, the choice between buying a Pixel is more than just the big one or the small one. At its I/O Developer's Conference, Google took the wraps off the Pixel 3a, a brand-new entry to the Pixel line that costs half as much as its older sibling. But how much are you really giving up when you opt for the cheaper model? Let's break it down.

Design

The Pixel 3 and Pixel 3a external designs are similar in many ways, including size. The Pixel 3a is slightly larger all around:

Pixel 3a: 151.3x70.1x8.2mm
Pixel 3: 145.6x68.2x7.9mm
Pixel 3a XL: 160.1x76.1x8.2mm
Pixel 3 XL: 158x76.7x7.9mm

Moving on to major design characteristics, the Pixel 3 and 3 XL are distinctive – if not as beautiful as flagships from Apple or Samsung. From the 3 XL's notch to the two-tone frosted-glass back, the Pixel 3 family is instantly recognizable at a distance.

The 3a follows a similar aesthetic, with some tweaks. The 3a XL doesn't have a notch, for instance, so there's a fair amount of space above the screen. The other big change is on the 3a's back: it's made of plastic rather than glass.

As far as external components, both have a single camera lens in the top left corner and a smooth 'window' above the matte body. The 3a lacks a front-facing speaker below the screen, as you'll find on the Pixel 3.

The 3a is also a bit lighter, particularly comparing the larger models of each:

Pixel 3a: 147g
Pixel 3: 148g
Pixel 3a XL: 167g
Pixel 3 XL: 184g

Display

While it would have been perfectly acceptable for Google to put an LCD display in the Pixel 3a, it opted for OLED technology, like the Pixel 3 line. However, the displays differ in quality when it comes to resolution and pixels per inch (ppi):

Pixel 3a: 5.6in FHD+ (2,220x1,080; 441ppi) OLED capacitive touchscreen
Pixel 3: 5.5in FHD+ (2,160x1,080; 443ppi) P-OLED capacitive touchscreen
Pixel 3a XL: 6in FHD+ (2,160x1,080; 402ppi) OLED capacitive touchscreen
Pixel 3 XL: 6.3in QHD+ (2,960x1,440; 523ppi) P-OLED capacitive touchscreen

The Pixel 3a XL has a 6in OLED display, a rarity among phones in this price range

While the smaller phones' displays are pretty close, the 3 XL uses a much higher-quality display than the 3a XL does. The displays are also protected differently against drops. The Pixel 3 and 3 XL use Gorilla Glass 5, while the Pixel 3a and 3a XL use Dragontrail glass.

Performance

One of the biggest differences is inside. Because the Pixel 3a is a budget phone, it has a slower processor:

Pixel 3a/3a XL: Snapdragon 670
Pixel 3/3 XL: Snapdragon 845

The Snapdragon 670 is decidedly a mid-range processor, while the Snapdragon 845 was last year's top-of-the-line chip. In benchmark testing, the 670 matches up closest with the original Pixel's Snapdragon 821 processor, so you're definitely giving up a fair amount of performance with the cheaper model. As far as memory goes, all four phones use the same 4GB LPDDR4x RAM. That should be plenty to keep apps and animations snappy.

Battery and charging

Google hasn't skimped on the battery with the Pixel 3a in the slightest. In fact, it's a little bigger than the ones in the Pixel 3:

Pixel 3a: 3,000mAh
Pixel 3: 2,915mAh
Pixel 3a XL: 3,700mAh
Pixel 3 XL: 3,430mAh

While Google says both will last “all day”, heavy users should be able to squeeze a little more out of the Pixel 3a, especially given its lower-powered processor, as well as the lower-resolution display on the 3a XL compared to the 3 XL.

When it comes to charging, both phones will fill up fast. With the bundled 18-watt USB-C power adaptor, Google says you’ll get seven hours of use on a 15-minute charge. However, you’ll definitely need to plug in your Pixel 3a in at some point, because it doesn’t have wireless charging like the Pixel 3 does.

Front camera

Google introduced its first dual-camera system with the Pixel 3’s selfie cam, so it’s quite different from the Pixel 3a’s standard single cam:

The Pixel 3a has the exact same rear camera as the Pixel 3

COMPARISON

Pixel 3a/3a XL: 8Mp, f/2.0, 1.12µm, fixed focus
Pixel 3/3 XL: 8Mp wide-angle (107 degrees), f/2.2 + 8Mp telephoto, f/1.8

Without a second camera, the Pixel 3a is missing out on the Group Selfie Cam feature, but when taking regular shots, you still get portrait mode and Super Res Zoom.

Main camera

Unlike the front camera, the Pixel 3a's rear camera is exactly the same as the one on the Pixel 3:

Pixel 3a/3a XL: 12.2Mp, f/1.8, 1.4µm, OIS
Pixel 3/3 XL: 12.2Mp, f/1.8, 1.4µm, OIS

The identical camera hardware is mirrored in the app as well. That means Top Shot, Night Sight, and the new Time Lapse are all available, as well as portrait mode. One note: On the Pixel 3, you get free unlimited Google Photos storage of everything you shoot no matter the size, but on the 3a, Google saves only the high-quality version for free.

Audio

Both the Pixel 3 and 3a include stereo speakers, but the ones on the Pixel 3 and 3 XL are 'front-firing', while the Pixel 3a has a speaker on the bottom edge. But the biggest difference is the headphone jack: The Pixel 3a has one, and the Pixel 3 doesn't. But you'll have to bring your own headphones, because the Pixel 3a doesn't include a pair of buds in the box.

Yup, that's a headphone jack on the Pixel 3a

Storage

While both sizes of both phones come with 64GB of storage in the base model, only the Pixel 3 and 3 XL include an option to upgrade to 128GB for an extra £100. None of the phones have an expandable storage slot for an SD card.

Colours

The Pixel 3 and 3a both come in black and white, with a slight variations: the power button on the white Pixel 3 is light green, while it's orange on the Pixel 3a. Each phone also has an exclusive colour:

Pixel 3a/3a XL: Purple-ish (with a yellow power button)
Pixel 3/3 XL: Not Pink (with an orange power button)

Price

Obviously the two phones have very different price tags, with the Pixel 3 and 3 XL occupying the premium

space and the 3a and 3a XL targeting budget-conscious buyers:

Pixel 3a: £399
Pixel 3a XL: £469
Pixel 3: £739
Pixel 3 XL: £869

Miscellaneous

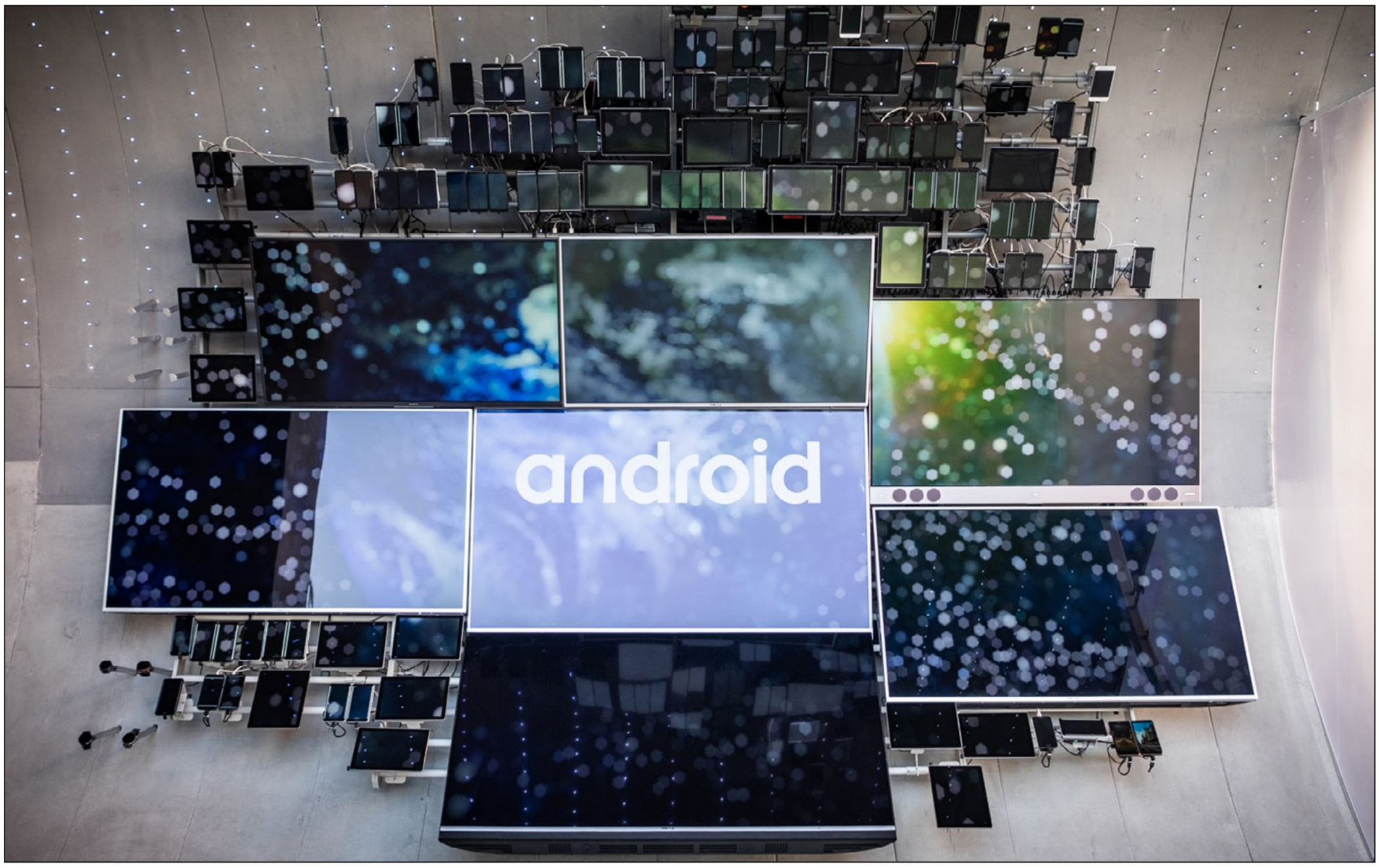
Other than the categories above, there are a few more things that are different between the Pixel 3 and 3a. The Pixel 3 is rated for IP68 dust and water protection, meaning you can dunk it in 1.5m of water for up to 30 minutes. Also, if you're a VR fan, you won't be able to use the Pixel 3a with Google's Daydream headset.

Verdict

If you're considering the smaller form factor, the Pixel 3 and 3a are extremely similar. They both have 1080p OLED displays, the same rear camera, very similar batteries, and bezel-heavy designs. So the difference really comes down to whether the Pixel 3's faster processor, dual selfie cam, wireless charging, and water resistance are worth an extra £340.

When it comes to the XL, the display on the Pixel 3 XL is both bigger and denser than the 3a, and otherwise the differences are pretty much the same as they are for the smaller models. The price difference is wider: £470. That means you can actually buy a Pixel 3a and a Pixel 3a XL for less than the price of the 3 XL.

FEATURE



How Google's Huawei licence ban could change Android forever

The battle has only just begun. MICHAEL SIMON reports

A bad month has just got a lot worse for Huawei. As we saw on **page 4**, Google has cut off the China-based smartphone maker's Android licence, preventing future Huawei phones (such as the upcoming Mate 30) from using the Play Store and Google's popular apps and services.

The bombshell comes just days after Donald Trump signed an Executive Order barring US companies from using telecommunications equipment made by firms that "pose a national security risk". While the order didn't single out Huawei, the Commerce Department simultaneously added Huawei to its Entity List, effectively banning the smartphone maker from buying parts and components from US companies without explicit government approval. Together, the two moves make it extremely difficult for any US company to do business with Huawei.

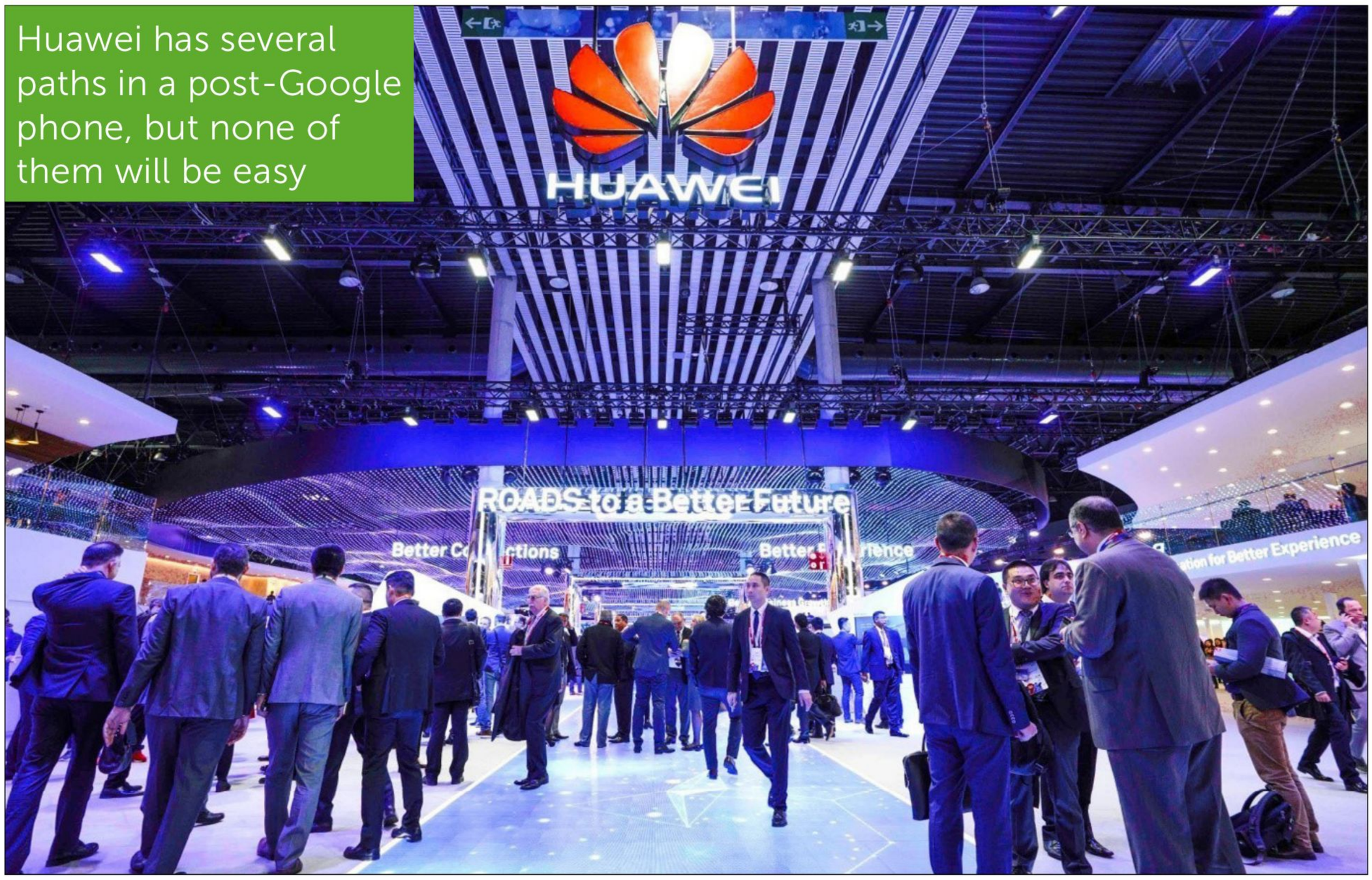
Hence Google's quick decision. The company assured Huawei users that updates would still be supplied for 90 days and said in a statement that it is merely "complying with the order and reviewing the implications", but the stakes couldn't be higher. When the dust clears, it might not be just Huawei that's forever changed: Google, Android, and the entire smartphone landscape could be indelibly altered as well.

Many options, few answers

If Google pulls Huawei's Android licence, that will obviously have a huge impact on both current and future Huawei handsets. While the contract doesn't affect the core OS, which is covered by the Android Open Source Project and free for anyone to use, Google charges for use of the Play Store and its application suite (Gmail, Maps, YouTube, and so on) for phones shipped to Europe.

Because basically all smartphone makers peddle their wares in Europe, the loss of that licence is a

Huawei has several paths in a post-Google phone, but none of them will be easy



serious problem. Huawei basically has three options going forward:

- Keep the existing EMUI framework, but eliminate all traces of Google in lieu of its own apps and store
- Partner with a third-party app store such as Aptoide
- Build a completely new OS that isn't based on Android

None of these choices is easy. As the second-largest phone maker in the world (after Samsung), Huawei makes dozens of different phones. A change of this magnitude would require a dramatic rethinking of just about every step of the process: design, engineering, marketing, price, and more.

If any of these options works, however, Huawei's sheer size could create the first true competitor to iOS and Android, and put a serious dent in Google's dominance.

EMUI as a service

To leave its EMUI OS intact and extract Google's apps, services, and the Play Store, Huawei would either have to develop its own app store or partner with an existing company. Of course, any attempt to replicate the current Android/Google experience without linchpins such as Maps and YouTube would almost certainly result in an experience inferior to what's offered now, with a much smaller catalogue of apps. Our phones may be able to do a lot out of the box, but both Android and iOS rely on third-party developers to augment device capabilities. Huawei would be at a serious disadvantage starting essentially from scratch.

Huawei's Watch GT runs a proprietary OS, which could be a precursor to a smartphone one

The most likely scenario is that Huawei will go it alone. We've already seen the strength of its engineering with the Watch GT, which uses the homegrown Lite OS rather than Wear OS. It's quite good, even without third-party apps.

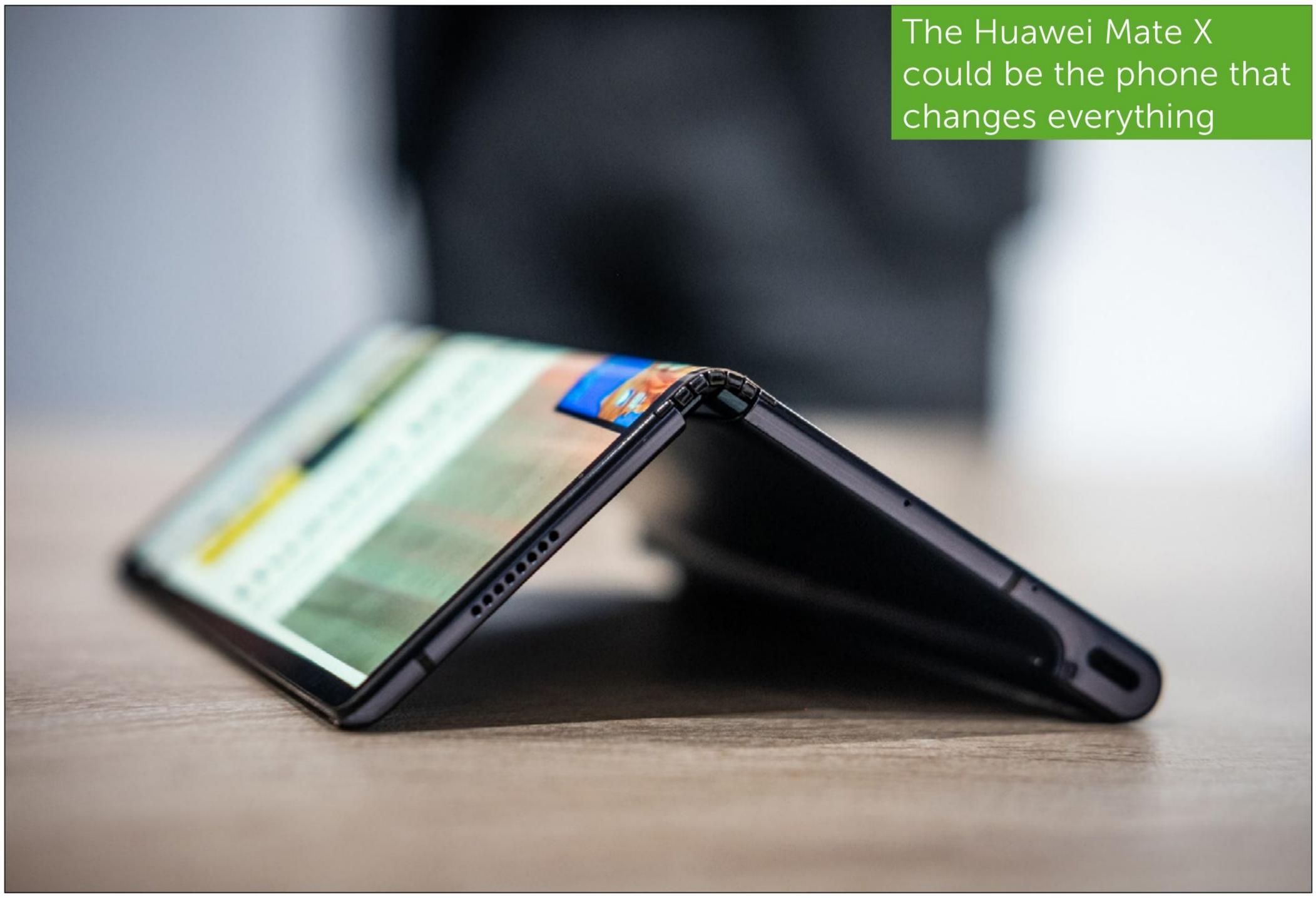
Of course, any Huawei phone would need major apps to succeed. If Lite OS is any indication, however, Huawei could build an alternative operating system integrated with its own services that doesn't feel like a cheap imitation. China-based WeChat already offers a platform-within-a-platform that brings messaging, video calls, games payments, and maps in a single launcher-style app. Huawei could make something similar for its phones, forgoing the traditional app-based environment for something entirely new.

If Huawei were as small as Oppo or even Xiaomi, another Android fork wouldn't be nearly as big of a deal. As Amazon has demonstrated with the Kindle Fire tablets, building an Android fork devoid of Google, and even carving out a niche with its own app store, is entirely possible. A similar move by a company as giant as Huawei, however, could shake the smartphone world to its core.

Slaying the giant

Huawei already has millions of devoted fans all over the world. If they suddenly realize that Google isn't essential or even central to the Android experience on their phones, it could begin to chip away at the company's dominance in the mobile space. Yes, Google controls all the cards, but Huawei is already a leader in China, where it makes its own chips and

FEATURE



modems, and adds plenty of tweaks and features on top of Android.

Let's not forget what's waiting in the wings: Huawei's first folding phone, the Mate X. Huawei was presumably working with Google to iron out the kinks in the unique UI ahead of its upcoming release, but now Huawei could use the hotly-anticipated phone to showcase its hardware and software innovations. After Samsung's Galaxy Fold suffered a setback, there's no reason to rush.

If smartphone giant Huawei is able to divorce itself from Google and Android without fading into irrelevancy, it would change everything about the smartphone landscape. Android would no longer

control 80 percent of the mobile market share. Samsung could follow suit with Tizen OS. Google would suddenly have more than Apple to worry about.

With a built-in fan base and tremendous growth, Huawei is uniquely suited to survive without Google. Whether the next step is a Google-less Android fork or a solo EMUI venture, much more than Huawei's future is in play.